THE FOUNDRY

VOL. 12. DETROIT, MICH., MAY, 1898 No. 69.

Notes From the Orient.

A good deal of fuss has been made about foreign trade, and time and again has our possibilities in this direction with China and Japan been painted in very rosy colors. The fact has been generally overlooked that the inhabitants of these countries possess a low purchasing power, are adverse to new methods, especially those introduced by foreigners, and lack the "hustling" which characterizes the Anglo-Saxon. Right next to us is the Republic of Mexico, which ought to furnish as good a market, in proportion to its size, as any of the oriental countries; yet very little prophesying is made in regard to its possibilities.

As tending to show some of the difficulties in the way of introducing foreign made materials in the Orient, and more especially manufactures of iron, we quote the following from a letter to Rogers, Brown & Co., written by their representative at Yokohoma, Japan:

"Thus far, things look rather discouraging, for the business methods here are a perfect barrier to foreigners. The Japs are suspicious of every move you make. They will keep you waiting just as long as they can, and then extend the time of engagement if they like. They will do no business between 12 and 2, and at 4 take out an hour for tea. All business here is slow enough to drive an American to despair. A day in America is worth five here. You cannot hurry them, and the foreigners have followed the same manner of doing things. Another great difficulty to overcome is in reaching the consumer of the iron. It is sold to a middleman, a Jap, who sells it to another man or a foundry. These middlemen are taciturn, will not tell to whom they sell or what becomes of the iron they buy, and consequently no records have been kept of results. Again, the Japanese foundryman wants cheap material. He asks not for quality, and does not care if he loses half his work. The Niagara brand is too good for the Japanese foundry, for at the present time they use anything as fuel, mostly a high sulphur coal, and spoil any good iron they use. The first consignment of coke has arrived in port, but is not yet unloaded. I find them all using 'Red Car,' Nos. 1, 2 and 3, and the same numbers of 'Gartcherrie,' both English irons of rather even fracture, but silvery in color."

Some of the writer's observations at Kobe, Japan, are shown in the following:

"Here, as in Yokohoma and Tokio, I find it very hard to work rapidly; in fact, it is difficult to do any work at all, for the Japanese are day by day living more within themselves and pushing the foreigners further away. They will buy the wares of a foreigner, but wish to impress him that they they know more about them than he, and that they can handle what they buy without outside help or instruction. In fact, locomotives bought abroad have been put together by the purchaser, the seller not being allowed to be present The pig iron business has not yet got quite so far, and they will listen to talks on the subject, but refuse to give information in return. In this section they are bound up in three brands, 'Red Car,' 'Gartcherrie' and 'Schotts,' the last being a Scotch pig of better quality than the former.

"There is much talk of the opening of their own iron fields and building of blast furnaces and manufacture of steel rails. In fact, the machinery is bought and 4,000,000 yen appropriated. They are planning to turn out 60,000 tons per year of rails. The engineers have lately returned from Germany, where they have been purchasing machinery and getting ideas. Some pig iron is now made in Japan, I believe about 5,000 tons per year, but that I have seen has been very hard.

"What has been a great surprise to me is the fact that no foreigners are now found in any of the works, and as you go about you are more than convinced that the Japanese have full controll of their industries. The foreigners were employed for a while, but no longer than necessary for the Jap to get their ideas and copy their methods. Then

they were forced out and Japanese substituted, so to-day you meet with none but the native. They apparently cannot improve, but can copy, so their machinery is behind the time and in bad condition, consequently I do not see how they can at any early period become formidable rivals of ours in the world's market."

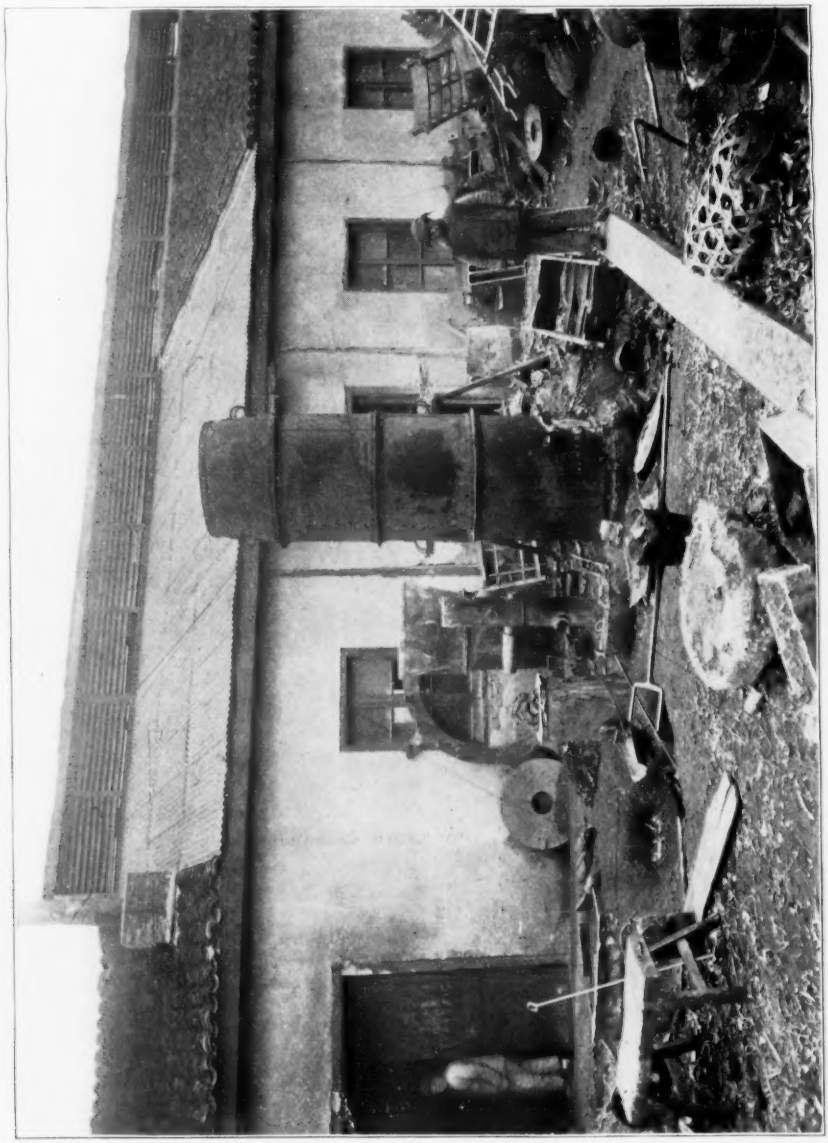


FIG. 1—TYPE OF CUPOLA IN USE THROUGHOUT CHINA AND JAPAN.

Writing from Nagasaki, the representative of Rogers, Brown & Co. says:

"All business here is greatly depressed, money is tight and trade very slow. I have sent you sample of Japanese coke for analysis. It is the best thing here, coming from the island of Kayagi. The capacity of the ovens is only about 1,200 tons a year. Here I find the great stumbling block to be inability to get iron to this port.

"The foundries about Yokohoma, Tokio, Osaka and Nagasaki, the four most populous districts of Japan, are numerous, but small affairs. There are exceptions, but they are very few. Even these are not large foundries, but keep a number of small concerns to whom they sub-let their work. The small foundries are to be seen throughout the

cities and in the back country, covering pieces of ground from 40 to 50 feet square, using from 30 to 200 tons per year, and buying at a time only enough for the immediate work. They make anything that is small, mostly kettles, pans, culinary articles, and repair work for machinery. The few larger plants in the cities make the engines, pumps and large machinery parts. The small concerns consume the greater part of the iron that comes into Japan. It must be prepared for them and taken usually some distance from the seacoast. The peddling business is done in this way: The pigs are all broken up into small pieces of about 3-inch cubes, packed in bags of 100 pounds each and shipped for miles throughout the country. The breaking up is necessary on account of the small cupolas, lack of wind power, coke, and also to facilitate shipment. The cupolas are all very small, ranging from 12 inches to 24 inches, occasionally 30 inches. They are portable, built up in sections about 8 to 10 feet high, standing in the foundry

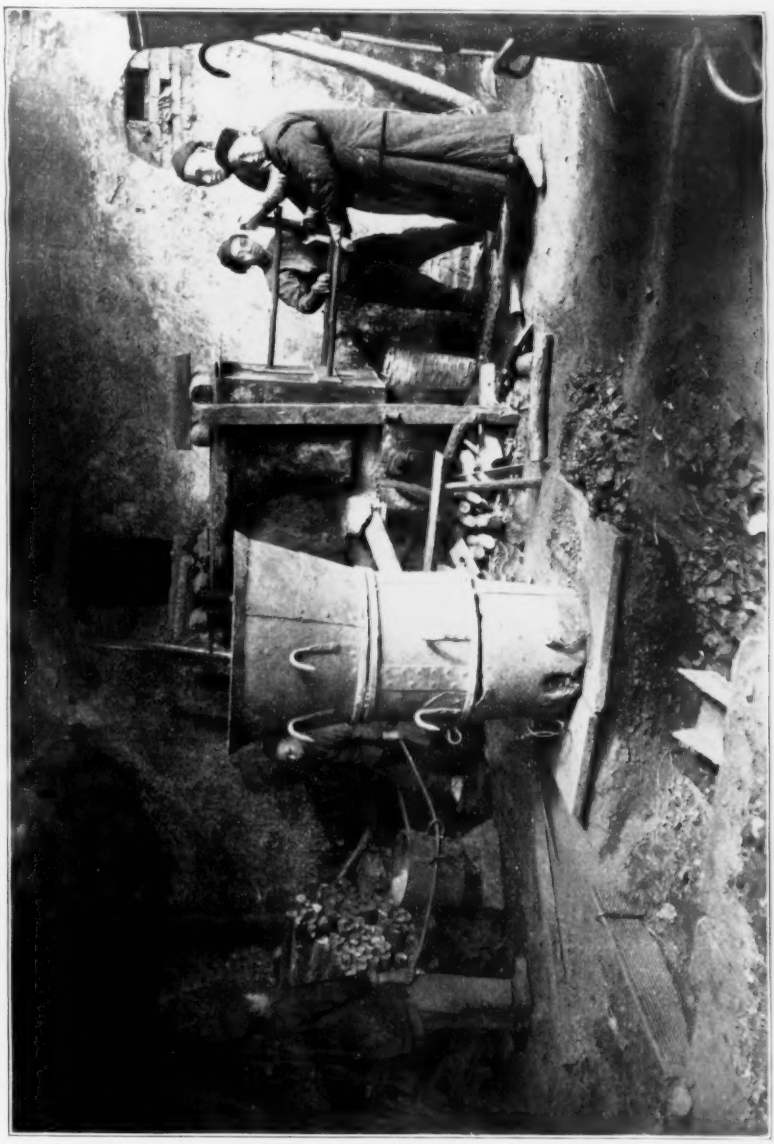


FIG. 2—CHINESE CUPOLA, SHOWING FORM OF WINDBOX AND BLOWING APPARATUS

like a stove. All the coke and iron is thrown over the top, and after the heat the cupola is taken down and cleaned. The wind is forced in by bellows worked by hand or foot power, and the coke used is very poor in quality. All this make it necessary to have the iron easily melted and in small pieces. The foundrymen are poor and have no credit with the foreigners, and nine-tenths of the firms have no name and their ownership is unknown. They buy their iron in lots of from 100 to 500 pounds at a time, and for this amount are given credit by the merchant. They will not deal with foreigners. In fact, no business is ever done with a Japanese consumer, which makes it necessary for the middleman or merchant to come between the importer and consumer. These middlemen are closely allied to each other. From Yokohoma to Nagasaki they are formed into a guild or combination, and their point seems to be to get ahead of the foreigner. These men buy the iron, break it up, distribute it, and as they allow a certain amount of credit to the consumer, control him. These men are greatly prejudiced against American iron, for it seems that they were once fooled on a large cargo of so-called 'Alabama' iron, which turned out hard, and it has been difficult to interest them.

"The Chinese pig iron is made by the Chinese government works and is sold only in Nagasaki. It is shipped here when the government foundry has a surplus. It looks like a charcoal pig, close and very black. It is strong and works satisfactorily, but the Japanese are prejudiced against anything Chinese. The price is about the same as 'Red Car.'

"The iron made in Japan that I have seen is quite brittle, low in manganese, sulphur and phosphorus. They mix it with 'Red Car' and Chinese iron and add manganese in the cupola."

That the aldermen of New York, Chicago and other cities are not the only people who seek an office for what there is in it is shown by the following observations of Chinese customs, written from Hong-Kong:

"Chinamen are not all laundrymen. In fact linen 'done up' in their native land will not bear inspection and one is led to conclude that the first representative reaching America hung out his shingle in that profession, and all new-comers, true to the characteristic prevailing among their bread winners (to travel a beaten path, use the same 'old brand' and stick to what has been tried) followed in his wake. In Japan they are money-changers and brokers and all compredores for the large houses are Chinamen. In their own land the 'schroff' is as necessary to the banks and business firms as their medium of exchange. He is their money handler, their cashier, their Bradstreet and their Dun. If a bill is to be changed or an account settled, they are both handed over to the 'schroff.' A bill of exchange at the bank or any manipulation of money brings forward the 'schroff' and his little reckoning machine. His fidelity is never questioned, his honesty and ability acknowledged. But China is a land of contradictions. This characteristic of honesty does not extend into the land of 'boodle,' as here termed 'squeeze.' It is always understood that where a squeeze can be imposed it should be to make the transaction a business one. A sale of any kind made by a Chinaman is usually productive of a 'quieting' sensation in the palm of his hand. Throughout the government works and different departments this method of business is carried on systematically, and a public office is for a certainty a 'private snap.' So much of this thing is done and so extensively is it seen that Chinese merchants have said that it would in time be the downfall of their government. The provincial government has more power and influence than the government at Peking. The mandarin of a section or province uses his position to better himself. His neighbor does the same. It matters not to one what benefits the other or how co-operation might be of good to the people. It is one section or institution for itself, and consequently patriotism and love of country have died out. North China considers South China a barbarous people and vice versa, and neither have a conception of their western country.

A Chinaman is bright but rather stubborn or pig-headed and consequently slow to comprehend; he is conservative to a degree exasperating to the importer, but his word is generally as good as a bond. He has a land that is immense, one that when opened up will doubtless develop great resources and provide a large market. A perfect network of waterways permeate her interior, but a vast territory remains untouched that is bound to consume great quantities of railway material.

"To-day the empire but starts on this career. Her interior is reached seldom by a foreigner, the railroads are few and slow in constructing. Farm lands are only gardens and iron industries are in their infancy. Demand for metals has not been great enough to warrant a rapid growth and only to-day is the situation assuming an aspect encouraging to those interested. Absence of railways and steam navigation until of late years, low structural work, ferries instead of bridges, aboriginal ways of tilling the soil, all have kept back the development of iron and steel manufacturies.

"Twenty or thirty years ago, when Shanghai and Hong-Kong began to grow, dock companies were organized to take care of the craft trading with these ports. Two started at Shanghai and one at Hong Kong and boats were docked and repaired and in this way iron and steel was handled in limited quantities. These docks are still at work, now large, well-organized, dividend-paying corporations, with improved machin-

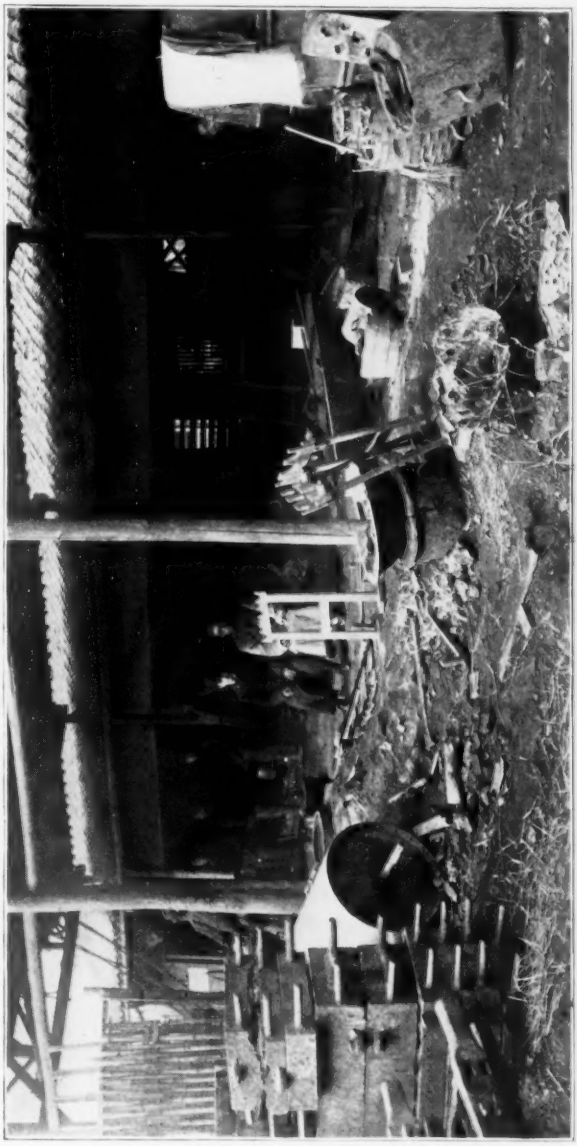


FIG. 3—INTERIOR VIEW OF A CHINESE FOUNDRY.

ery and a steadily increasing capacity, until to-day ships of moderately large tonnage are launched in surprising numbers. These large enterprises on the borders of China are foreign corporations. It is true they are not numerous nor is any one department of them large, but it is a surprise to see in these remote parts such institutions. While in one you imagine yourself in parts foreign to China when the machinery is in question, but the labor you see on all hands is a reminder of the truth. In Shanghai are three dock companies, the only foreign iron-using concerns there. In Hong-Kong one company with three large docks and two fair-sized engineering companies, making small craft, engines, etc., comprise the foreign representation for that port. All the way from Port Arthur on the north to Hong Kong on the south appear dock companies along the coast, but they are lesser concerns, and mostly engaged in small repair work. The remainder of China's iron manufacturing and consuming industries are her own. Foreigners at one time may have had the management of departments but to-day, for the most part, Chinese have control. Her arsenals show a reaching forth for advanced knowledge in machinery. Shot, shell and projectiles are made, small and large field pieces are turned out in moderate numbers, rifles are constructed and all is done with modern machinery.

"Tien Tsin supports two arsenals—turning out projectiles, shot and shell in one and large guns in the other. Nankin makes field pieces and repairs rifles, and Hang Yang, far up the Yangse Kiang, has an arsenal, closely allied to the government iron and steel works, that boasts of the latest and most improved machinery. Here the Mauser rifle is made and field pieces of some size. The iron and steel works has had quite a tussel for existence, but to-day it is slowly rolling out rails, angles and T's and the blast furnaces are supplying the steel furnaces with an uncertain quality of pig iron. Coal, coke and ore comes from a distance of one hundred miles, by slow stages; but a railroad, now in process of construction, will soon have them in closer communication.

"Eighty-five 64 lb. rails is said to be the capacity of the mill but half that number is all the Chinamen get out, and eight Mauser rifles are finished where twenty should be. Mr. Kennedy, of Pittsburg, who until lately managed the mill at Hang Yang, got from it, I am told, though under adverse circumstances, the full capacity, and left a most favorable impression.

The Shanghai arsenal is one of the oldest and largest. It covers an immense amount of ground and within its walls are a vast amount of machinery. Rifles are made and repaired, shot and projectiles turned out and with the aid of two Siemen-Martin furnaces and three trains of rolls of late design bars and plates are rolled. The coke and pig-iron is all imported, the latter coming from Sweden and Scotland, the former from England.

Foochow and Canton each have an arsenal, the former at times doing some energetic work in the line of field-pieces, shot and shell and the latter confining her attention to that of repairing.

So it is plainly seen that the government of China is stepping forward in the manipulation of iron and steel. She is slow and uncertain in working it but it is a new venture and experience is as necessary in the far East as it is in America. The babe has been born. With training and good example it may develop into a man of might, but deceived by those of experience, deprived of her very members of might and defence, China may only grow to be a cripple—a dependent and not a master.

The Chinaman, above most things cares for his "chow" of food. Rice and soups are the dishes set before the masses, and long ago necessity proving herself the mother of invention taught him to manipulate the ore and fashion a mold in a fitting manner to turn out articles for his culinary department. He has made most wonderfully, for years back, pots and pans, and thus we trace the establishment of foundries to times long past. The foundries were, and still are, small, primitive affairs, and are found in all directions, in the cities and in the rural districts, wherever mouths are found to feed. A foreign molder would think several times before making these pans. They range from 20 to thirty inches across, and are so thin it seems almost impossible to get the metal to fill the mold. They have their own mixture for this work, and although imported iron is used by them in other castings, they still hold fast to the formula—half Chinese pig and half "old-pan." How the first pan was made without the latter ingredient is a mystery. The mold used is very simple. It is

only two cores, one concave, the other convex, fitted so as to leave between them the thickness and shape of the pan designed. The convex core is the "drag" and the concave the "cope," the bottom of the pan acting as runner for the casting.

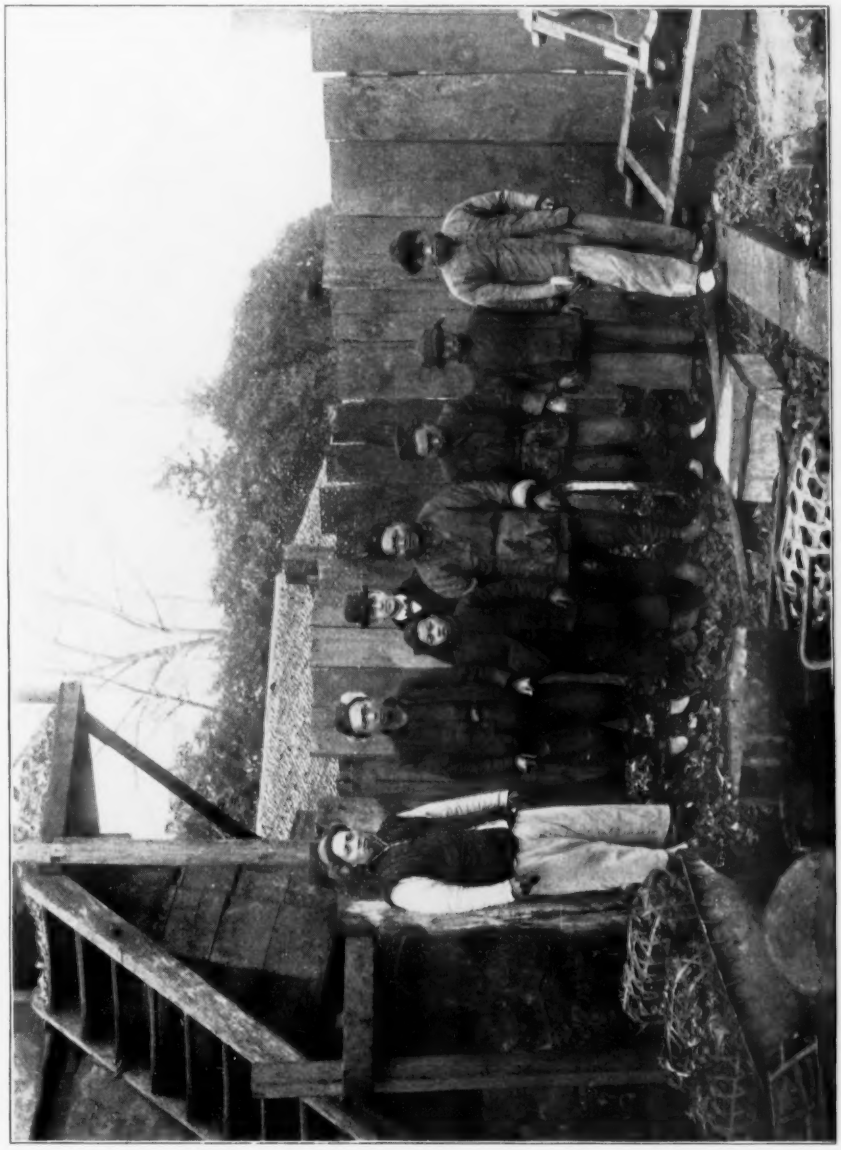


FIG. 4—TYPES OF CHINESE FOUNDRYMEN.

These cores, or molds, are made of brick and clay and baked hard, washed with powdered charcoal, and used again and again.

The country foundries turn out these pans in great quantities, besides small work for the villages; but the city concerns, small though they be, make in an admirable manner engine and pump parts and all repair work for the large cotton and silk mills. These foundries are all low, small buildings, fitted in most any place, between shops on a principal street or at the rear of a dwelling. Their space is limited and their appliances equally so. The fuel is the poorest looking coke imaginable, some coming from Chinese ovens, but the greater bulk from England, who finds here a large market for her cast-off stuff ,and receives in the region

of thirteen gold dollars a ton for it.

Cut No. 1 shows a group of cupolas, the style of which is common throughout both China and Japan. These in the picture belong to a large concern in Shanghai, and are soon to be replaced by those of later design.

Cut No. 2 gives a typical Chinese cupola and "wind-box," and is the first one on record to use American pig iron in China. This style also is general and all foundries have one or more like it. Some are built up in this shape with brick and mud and so remain permanent until burned out. Some are smaller and others larger, the size of the heat determining which cupola shall be set up before the wind-box for that day's run. The "wind-box" is not alway worked by hand, but by foot power, coolies stepping on and off a "see-saw" arrangement, which alternately raises and lowers the bellows.

Cut No. 3 gives the interior view of Yuen La foundry, one of the few light enough to photograph. This is a large one for China, melting about 250 tons of metal a year.

Cut No. 4 will show the American foundrymen those with whom they will have to compete when China enters the race. No. 1 stands on the extreme left, an unwilling subject for the camera. This group is one-half the force employed at this place, the remainder refusing to risk themselves before the machine.

Wages here are about the same as in Japan, and the condition of living similar. No. 1 receives from $1.25 to $1.50 (silver) a day, and each of his molders half that amount. The laborer, or "cooley," is paid from 20 to 30 cents for nine hours' work, and a bit extra for over time.

The molder does slow but fair work, and on the whole a Chinese foundryman is much more of a success than one would imagine from his looks. He is heavy and clumsy in appearance, and certainly is languid in his movements.

The foundry is here, but needs many improvements; the molder plies his trade, but several years' more apprenticeship must be given him before he can fashion a mold like an American. The rolling mill, the steel furnace, the coke ovens, and blast furnace, all are in evidence, but time yet will pass before China can expect to supply her own market, a market which will grow as civilization pushes into her interior, an interior vast and rich.

(We are indebted to Rogers, Brown & Co. for the information contained in this article and the illustrations appearing in same.—Ed. THE FOUNDY.)

Need of Greater Uniformity in Pig Iron Analyses.*

By THOS. D. WEST.

While the past four years have witnessed a greater revolution in foundry practice than any like period, methods of making mixtures were never in the plight in which we find them to-day. The recent introduction of chemistry in founding has brought a realization of the impossibility of accurately judging the grade of an iron from fracture; yet there is still a prejudice with many against chemical analysis as a determiner of grades or as a basis for making mixtures. It is unfortunate that there are features involved in such analyses that give the opponents of chemistry some ground for throwing doubt upon it. All improvements have to combat with more or less prejudice and difficulty before they can establish themselves. For this reason those who know from experience the value of working by chemical analyses, should not be discouraged or sit still and let the retarding influences have full sway. The thing to do is to determine the factors that tend to prevent the general use of chemical analyses, and work to correct what needs correcting. The writer knows from experience some agencies that retard the general utilization of chemical analyses in making mixtures and in connection with this paper will cite a few of them.

At the outset two considerations may be stated: First, the founder who continues to make mixtures by judging the fracture of pig metal, will find that the iron in his castings is not always what he would like to have it and will often cause him heavy losses. Second, the principles underlying chemical analyses are established and their correct application gives the greatest assurance of attaining desired ends.

What is best to do, retain the old practice, or strive to perfect the new? This is a question that interests the maker of pig iron, as well as the consumer; for if the blast furnaceman can remove thereby any of the

*Paper read before the Pittsburg Foundrymen's Association.

grounds of complaint by users of his product, he certainly has much to hope for from any progress toward perfecting analyses in making mixtures of iron. In one sense, the use of chemical analyses is but a comparative method, a guide to desired ends in making mixtures. With a certain percentage of silicon, sulphur, phosphorus, manganese and carbon in iron, other conditions being alike, as to fuel, etc., the progressive founder knows very closely just what physical results he may expect from his mixtures. If all the procedures have been correct, he will get expected results, but the difficulty lies in the possibility of error. For example, if a founder has been receiving metal from one furnace that has a careful chemist and correct methods of determination, he will obtain—providing no errors have been made in the shipment or charging of iron—the results he counted on, in making his mixtures. But should this furnace change chemists or the founder secure iron from another furnace—changes occurring every day—we then find conditions that may destroy the comparative results of past practice in making mixtures. Such changes often cause bad castings or castings lacking in the physical properties desired, and may result in the furnaceman being censured or losing his trade. The trouble would have been avoided had the founder understood how to allow for the new chemist's methods of analysis.

Two other factors are to be mentioned that affect the value of analyses: The character of the chemist's work and the purity of the chemicals used. Serious harm may be done by a careless chemist and such men should have no place in a chemical laboratory. Mistakes are liable to happen with any man, but where one is indifferent to them, no consideration should ever be extended. The strength and purity of chemicals is an important matter also. To guard against variations in this regard, all chemicals are tested when received, and the impure rejected. To determine the variation due to the method and to personal factors, the practice of standardizing drillings is followed. A chemist will first obtain from 5 to 20 pounds of clean, fine, well mixed drillings, out of which he will send samples for analysis to four or more chemists of known ability and accuracy in their work. The reports of these analyses may be two to five months in coming back. When all are received, he will accept the average as a standard. The labor and expense involved in procuring standardized drillings for testing chemicals or analyses are considerable, and suggest the question: Why cannot a central

TABLE 1—COMPARATIVE ANALYSES OF FOUNDRY IRON.

No.	Laboratory.	Sil.	Sul.	Phos.	Man.	G. C.	C. C.	T. C.
1	*A	1.95	.011	.60	.63	3.35	.48	3.83
2	B	2.00	.010	.543	.56			4.27
3	C	2.02	.0045	.615	.56	2.99	.64	3.63
4	D	2.05	.010	.59	.69	3.20	.52	3.72
5	E	2.05	.007	.59	.60	3.41	.45	3.86
6	F	2.06	.011	.617	.62			3.85
7	G	2.06	.013	.579				
8	H	2.11	0.11	.617	.54	3.12	.80	3.92
9	I	2.13	.006	.503	.56	3.04	.44	3.48
10	J	2.158	.018					
11	K	2.16	.015	.612	.550			
12	L	2.19	.012	.591	.504	3.29	.82	4.11
13	M	2.21	.008	.61	.46	2.82	.36	3.18
14	N	2.21	.018	.600	.546	3.59	.32	3.91
15	O	2.22	.020	.54	.59	3.32	.25	3.57
16	P	2.224	.018	.603	.59	3.42	.29	3.71
17	P	2.219	.019	.614	.60	3.45	.23	3.68
18	P	2.228	.017	.610	.58	3.36	.40	3.76
	Greatest Variation.	.27	.0155	.114	.23	.77	.59	1.09

*Corresponding letters in the four Tables signify that analyses are from the same laboratory or firm.

laboratory be maintained where all chemists dealing with cast iron could obtain standardized drillings promptly and at a price comparatively small? As the writer is surrounded by blast furnaces and their laboratories, he has often thought of the steps that might be taken toward the establishment of such a standardizing laboratory for furnace work and iron founding.

ure of presenting in this paper 46 sets or 273 separate analyses from leading laboratories in the different iron working sections of this country and one from Canada. The samples the writer selected for the drillings lie before you on the table. Here are three pieces of pig about 9 inches long, having ¾-inch holes drilled about 2½ inches deep from the face down, and as close as they could be ob-

TABLE 2—COMPARATIVE ANALYSES OF BESSEMER IRON.

No.	Laboratory.	Sil.	Sul.	Phos.	Man.	G. C.	C. C.	T. C.
19	A	2.12	.060	.088	.73	3.19	.75	3.94
20	C	2.15	.048	.094	.93	2.78	.85	3.63
21	D	2.20	.056	.086	.91	3.10	.64	3.74
22	F	2.21	.051	.093	.95			3.81
23	S	2.25	.058	.090	.90			
24	E	2.29	.048	.080	1.09	3.14	.57	3.71
25	R	2.30	.051	.087	.910	3.46	.50	3.96
26	B	2.31	.056	.083	.89			3.80
27	K	2.31	.060	.0865	.890			
28	O	2.32	.051	.086	.84	3.06	.25	3.31
29	L	2.32	.055	.111	.809	3.51	.84	4.35
30	Q	2.37	.058	.087	.83	2.92	.82	3.74
31	P	2.445	.064	.086	.93	3.15	.67	3.82
32	P	2.402	.066	.084	.98	3.20	.68	3.78
33	P	2.413	.060	.086	.96	3.12	.72	3.84
Greatest Variation.		.32	.018	.031	.36	.73	.60	1.04

TABLE 3—COMPARATIVE ANALYSES OF CHARCOAL IRON.

No.	Laboratory.	Sil.	Sul.	Phos.	Man.	G. C.	C. C.	T. C.
34	D	.95	.019	.89	1.76	2.90	.78	3.68
35	A	.97	.017	.96	1.77	3.10	.88	3.98
36	L	.97	.013	.929	1.795	2.94	.91	3.85
37	E	.98	.016	.91	1.80	3.01	.79	3.80
38	R	.98	.022	.957	1.98	3.25	.60	3.85
39	C	.99	.016	.956	1.90	2.84	1.02	3.86
40	T	1.00	.016	.952	1.90	2.69	.48	3.17
41	F	1.02	.017	.948	1.93			3.95
42	B	1.04	.021	.906	1.83			3.76
43	N	1.09	.033	.932	1.768	3.30	.44	3.74
44	P	1.161	.027	.931	1.85	3.20	.56	3.76
45	P	1.152	.025	.930	1.80	3.28	.44	3.72
46	P	1.157	.024	.930	1.90	3.25	.48	3.73
Greatest Variation		.21	.020	.067	.22	.61	.58	.30

In a paper read at the November meeting of this association, the writer solicited the addresses of chemists willing to analyze drillings, so that the results could be checked up and compared. It was surprising the great interest manifested in the work. As a result of this call, the writer has the pleas-

tained. The drillings from these samples of foundry, Bessemer and charcoal pigs respectively, were kept separate, and those for each pig thoroughly mixed, so as to ensure that all samples sent out were exactly alike, as far as it was possible to get them by the use of pig metal. Pig iron was selected in place

of making any special castings, so as to test particularly the ordinary practice followed at blast furnaces, in taking drillings from pig metal.

The writer's thanks are tendered to the various firms and chemists mentioned in Table 4 for so kindly furnishing the analyses seen in Tables 1, 2 and 3. It has taken no small expenditure of time and money to obtain these analyses, and it is to be hoped that the end sought by this paper will lead all the contributors to feel that their labors have been devoted to a good cause.

Considering that drillings were taken from pig metal, which are not as good for checking purposes as those taken from a clean, especially prepared and solid casting, and that there is no uniformity of method in analyses at the present time, the close results seen in Tables 1, 2 and 3 are very creditable to the various chemists and demonstrate that great care was exercised by all. In justice to the donors of these analyses, it is to be said that the analyses given by the respective firms and chemists may not represent half of their work, as checks were run on the analyses reported to make sure no error had been made. To illustrate what is meant by "checks" the last two analyses of each table are cited, which are Dr. Moldenke's checkings. This is, of course, more exacting practice than is generally carried on in the daily routine work of furnace laboratories. For this reason a much greater variation in the analysis of pig iron as it leaves the furnace yard for the foundry may be expected than is shown by Tables 1, 2 and 3.

The first suggestion that will come to the practical furnaceman and founder in studying Tables 1, 2 and 3, and which are arranged in the order of their variations in silicon, is whether the variation found in the analyses of the respective pig metals are sufficient to have any serious effect on their comparative value when applied to making mixtures of iron. To aid in seeing clearly what are the greatest variations to be found in the analyses shown, attention is called to the last line of each table. In Table 1 there is an actual difference of .27 for silicon, .0155 for sulphur, .114 for phosphorus, .23 for manganese, and 1.09 for the total carbon. Table 2 shows a variation of .32 for silicon, .018 for sulphur, .031 for phosphorus, .36 for manganese and 1.04 for total carbon. Table 3 shows .21 for silicon, .020 for sulphur, .067 for phosphorus, .22 for manganese and .030 for total carbon. When such a difference is to be found in analyzing pig metal where the greatest care and skill has been exercised as exhibited in Tables 1, 2 and 3, what are the chances to be run in accepting

TABLE 4—FIRMS AND CHEMISTS FURNISHING COMPARATIVE ANALYSES.

Laboratory.	Analyses	Concerns Furnishing Analyses.
A	3 Sets.	Buffalo Furnace Co., Buffalo, N. Y., Frank Hersh, Chemist.
B	3 Sets.	Carnegie Steel Co., Cochran, Pa., J. M. Camp, Chemist.
C	3 Sets.	Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., J. R. Harris, Chemist.
D	3 Sets.	Embreville Iron Co., Embreville, Tenn., F. E. Thompson, Chemist.
E	3 Sets.	Phillips Testing Laboratory, Birmingham, Ala.
F	3 Sets.	Illinois Steel Co., South Chicago, Ill.
G	1 Set.	Spearman Iron Co., Sharpsville, Pa., W. E. Dickinson, Chemist.
H	1 Set.	Thomas Iron Co., Hokendauqua, Pa.
I	1 Set.	Everett Furnace, Everett, Pa., F. R. Bennett, Chemist.
J	1 Set.	Booth, Garrett & Blair, Philadelphia, Pa.
K	2 Sets.	Crane Iron Co., Catasauqua, Pa., H. A. Knauss, Chemist.
L	3 Sets.	Hamilton Furnace Co., Hamilton, Ontario.
M	1 Set.	James C. Foster, Sheffield, Ala.
N	2 Sets.	Warwick Iron Co., Pottstown, Pa., Wm. A. Stephan, Chemist.
O	2 Sets.	Andrews, Hitchcock & Co., Youngstown, Ohio.
P	9 Sets.	Dr. R. Moldenke, Metr. Eng., Pittsburg, Pa.
Q	1 Set.	Bethlehem Iron Co., So. Bethlehem, Pa., A. L. Colby, Met. Eng.
R	2 Sets.	Claire Furnace Co., Sharpsville, Pa., D. K. Smith, Chemist.
S	1 Set.	Stewart Iron Co., Sharon, Pa., E. R. Sanborn, Chemist.
T	1 Set.	Superior Charcoal Iron Co., Detroit, Mich., W. P. Putnam, Chemist.

analyses made by the different rapid methods in the rush of every day furnace practice? Here we have, with the best of care and skill, a variation in the ingredients, mainly due to a lack of uniformity in laboratory methods and of a standard for analyses sufficient to affect two-thirds of all the castings made, causing them to be either bad, or ill-suited for the use for which they were intended.

Is it not time that furnacement and foundrymen were awakening to the necessity of co-operating to secure greater uniformity in the methods of making chemical analyses and in establishing a central standardizing agency?

The writer holds a description of several of the methods used for obtaining the analyses shown in the tables and chemists who have seen them could outline their reasons for giving different results. As the writer is not a chemist, he does not assume to discuss anything regarding their work. Some good work is now being done in this line by a committee headed by the eminent Dr. C. B. Dudley. It is to be hoped that the near future may see such a co-operative agency as that referred to, so that it may be patronized by all chemists employed in the manufacture or use of cast iron.

The Use of the Riser in Casting.

BY A FOREMAN MOLDER.

"Riser" is the name given to the overflow of a mold, indicating when a mold is filled at the time of casting. Risers are necessary for a three-fold purpose:—First, as already stated, to show when a mold is full; second, to relieve the highest part of a mold of the dirty metal, which invariably makes for the highest part; and third, for feeding purposes. They likeswise assist in checking the strain and velocity—two very important matters for which a molder must intelligently provide.

In the first place, it is necessary in casting for one to have an idea as to the most suitable moment for checking the ladle. It is no uncommon mistake to see a mold unduly strained for want of precision in this matter. By an intelligent observance of the habits that accompany risers, such as noticing the gases blowing off, and whether the risers are shut or open, the practised ear and eye have no difficulty in detecting the immediate appearance of the metal.

The number of risers in a job should always be fixed as far as practicable and be proportioned in accordance with the size of the pouring gates. Care should be taken to have the risers at all times somewhat less than that of the pouring gates, otherwise the force of compression necessary for casting will be a failure. If we consider a job being cast, the risers of which are twice that of the pouring gates, and the metal is somewhat duller than desirable, there is nothing surer than that the casting will be lost for want of compression on account of the metal having failed to rise into the riser basins, the extra area of the risers diminishing the hydrostatic pressure, which in its turn causes the metal to set, and in consequence of this the casting will show defects in its highest parts. These defects are more apparent where flat surfaces predominate. No doubt much work is cast without the aid of risers, but it is mostly of an architectural order. Even in this class of work some prefer what is called a blow-off about the corners or terminus of the mold, which is the means of brightening up what would otherwise be a dull part of the casting; but as this may not be more than a twentieth of the pouring gate, it is not necessary to treat it after the manner of a riser. This class of work is always preferred with as little broken skin as possible, and as it must be cast at a high temperature, risers are not a necessity. The principle of molding here adopted is what is known as the "turn over," with top and bottom. These being tightly clamped, there is no real danger from straining, no matter at what speed the mold may be filled.

The placing of a riser on the highest part must at all times be observed, at the sacrifice of all other considerations. It may be that proportionately to the thickness of metal there is no real necessity for placing a riser here for feeding purposes; but as this is the highest part of the casting, the riser is indispensable, in order to relieve the dirt or kish which is sure to locate itself in this part. While clearly showing the necessity of the risers on the highest parts, it is likewise necessary to place risers on other parts which may have considerably thicker metal, as often occurs with certain castings containing valve seats.

It is not advisable that a feeding rod should be put more than three or four inches into the mold; and having placed it in this

position, it is then wrought up and down sufficiently to keep the gate from closing, in order that the fluid metal which is lying in the basin will supply the castings, to solidify this particular part of the casting. The molder must be on the look out to guard against too much feeding, and the moment he notices the metal assuming a pasty nature he should work his rod gradually out of the mold.

Having shown the riser in its first and second purpose, we will now consider the third purpose referred to—i. e., as a means of solidifying certain parts of castings, those parts in general being flanges of cylindrical-shaped castings, cast in the horizontal position. There are other forms of castings besides these which might be referred to, but as they are so numerous the one referred to will suffice. As this paper is simply intended to show the use of the riser in casting, it would be unwise to touch upon the different classes of work necessitating the assistance of the feeding rod, which is as frequently applied to the pouring gate as it is to the riser. In Fig. 1, riser B, it will be seen that the flange is much larger than that at A at its opposite end. Of course this flange is proportionately thicker, in consequence of which this part of the casting is longest in setting; and with no application of the feeder here, the only result possible would be what is termed a drawn hole, showing

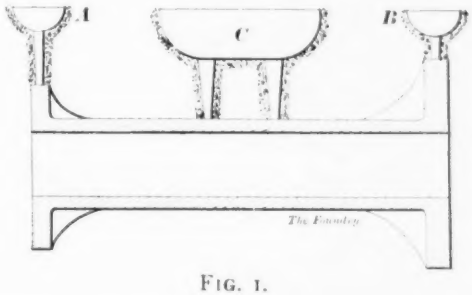


FIG. 1.

itself a considerable depth into the casting. This would be more intensified were the riser of a small size—say one-third the thickness of the flange. The riser B should be of an oblong type, its breadth not less than ¼ or 3-16 in. aside less than the full thickness of the flange. It must be obvious from this increased size that the riser gate remains fluid for a longer period, which in its turn has the better chance of feeding the flange, even though no rod be applied.

While such a gate as the one described may be reckoned as a factor of safety in securing a solid flange, it by no means guarantees a solid casting, and entire satisfaction can only be obtained by the use of such a gate and the action of the feeding rod. In Fig. 1, basin C, the flange being considerably less, there is no real necessity for applying the feeding rod here, as many molders do. It is simply a waste of time and material to do so, as the action, coming from the highest part, is amply sufficient for all its demands. We have used Fig. 2 as a contrast to show the difference of a cylindrical body without flanges in its relation to risers and feeding.

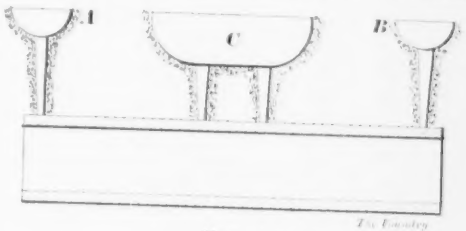


FIG. 2.

A casting of this type has the same necessity for risers as the previous one, with this difference, that Fig. 1 may be said to serve a two-fold purpose—that is, while relieving the mold of its dirtiest metal (which invariably makes for the highest part of the mold), it also serves the purpose of feeding; but as Fig. 2 shows no flanges, and there is nothing but proportionate metal throughout, feeding is not a necessity. But it is equally necessary that the gates at the extremities must be there, in order that those parts of the casting may be as clean as it is possible to get them.

The reader will see from the figure under consideration that the metal is striking right across the back of the core and finding its way to the bottom; it gradually rises right to the spot where it first entered the mold, but on its return it has laden itself with an accumulation of dust and the oxide of iron. Next we will take up the question of the opening or closing of the riser at the time of casting. It is stated by those who seek to uphold the opening of risers at the time of casting, that the increased volume of air and gas under pressure naturally seeks for a speedy exit, and if refused such, the result can only be detrimental to the mold for scrabbing. Then, again, they maintain that by keeping the risers open, the dust caused by the motion of the gas finds an easy way

of escape, which is the means of securing a sound and clean casting. This sounds all very well in theory, but they seem to forget that with closed risers there is no current of gases blowing off. The mold being hermetically closed, is sound; everything inside is in absolute quietness, and the gases give way to the fluid metal as it finds its way through every crevice of the mold, and lands itself up through the riser with comparative placidity. But without an opening there can be no current, no matter with what pressure of gas a mold may be filled. No two molds can be said to generate gases alike, they at all times being dissimilarly placed through variation of temperature and dampness inherent to the sand and atmosphere. Take as an example a dry-sand mold which is comparatively free from gases; it is of little consequence whether its risers be open or shut. Should the current be blowing off with considerable force, there is no dread of anything going wrong with the mold, the strength of which is more than able to resist the strongest current possible. Then, again, the gases being almost nil compared with a green-sand mold, we have always been inclined to leave the risers open, such being the means of allowing any steam caused through dampness—created, it may be, through the stamping of bearings or daubing of joints with loam—to escape. The treatment applicable to risers in dry-sand work is equally good for loam. But to return to the most critical point—namely, risers in heavy green-sand work,—we would in every case advise those who have to handle such to rigidly abide by closed risers.

We may now make a brief allusion to the advantages of compressed gas sustaining a mold at the time of casting. Before proceeding to this point it would be well to consider from whence these gases come. In the green-sand mold, the sand may be said to contain about 20 per cent. of coal in the form of coal dust, which is ground to the finest possible condition; then the other ingredients in the black sand, which forms a good part of the bulk of the facing sand, contain in a moistened state what may be termed marshy matters, all of which combine to form the gases referred to. A mold that is ready to receive metal can contain nothing but air; but immediately molten metal enters such a mold, the gas begins to generate, and is intensified in pressure until the mold is finally filled, such gases being forced to make their exit through the interstices of the top part and the surrounding vent holes which usually accompany green-sand molding. This is one of the primary advantages which are to be obtained by the risers being closed. If we consider for a moment a mold with its four sides, we shall see what advantages are to be gained with such a mold under gas compression. The fact of such a force seeking for an exit goes a great way to sustain the whole interior, and no part of the mold is more sustained than the top, this part being the most critical for drawing down through the heat of the metal, and more especially is this so where the mold is too long in filling. No such advantages as here referred to can be got with the risers open, as the gases under such conditions are supposed to pass freely through the risers as they generate in the mold, therefore we shall continue to keep to the closed riser, knowing that with such it is an impossibility to err in so far as the treatment of risers is concerned.—(Mechanical World, Manchester, England.)

The Mission of the Riser.

BY PHIL. GARLICK.

If a casting should be so proportioned as to leave a heavy connecting link between the gate and the riser, there is danger, if very light sections exist in the casting, that these will not be filled, because the metal flows where it finds the least resistance. If it should thus be easier for the metal to follow the heavy portion of the casting and find an outlet through the riser than to fill the light sections of the casting, then the riser becomes an absolute detriment. Several cases have been known where such castings refused to run, when risers were placed thereon and the difficulty was entirely overcome, when the latter were discarded.

The old saying that "where ignorance is bliss it is folly to be wise" accounts for many of the oddities in practice, which one encounters in the foundry. Those therein engaged often lack a knowledge of the essential principles of dynamics, and many of the contrivances made with the intention of securing a more perfect product, become useless through their violation of physical laws. When "A Foreman Molder" tells us that "there is nothing surer than that the

casting will be lost for the want of compression on account of the metal having failed to rise in the riser basins, the extra area of the risers diminishing the hydrostatic pressure," he exhibits an ignorance of dynamic laws, which is too common in the foundry. Hydrostatic pressure is not regulated by the size or shape of any inlet or outlet, which may be placed on the casting but is governed entirely by the height of the fluid metal. We might as well say that the pressure of water in a tank depended on the size of the outlet instead of upon the height of the water, as to say that the size of the

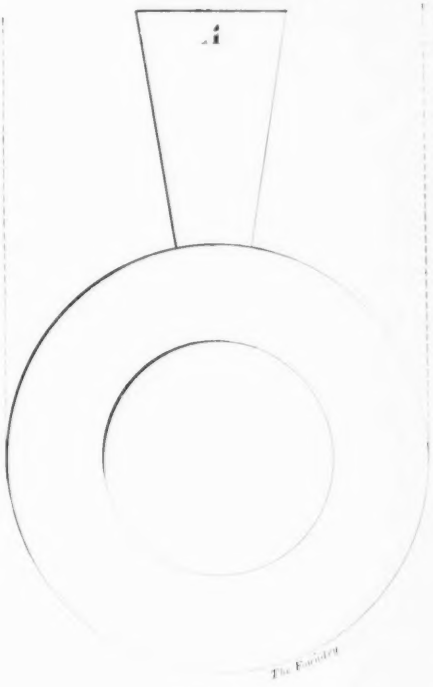


FIG. 3.

riser determined the hydrostatic pressure in a mold. The pressure in a mold depends solely upon the height attained by the metal. It will also be news to many foundrymen that in a mold having top and bottom clamped together, there is no real danger from straining. Plates and like castings, molded in flasks, not provided with crossbars of sufficient rigidity to withstand the hydrostatic pressure, will strain at the center every time without showing as much as a fin at the edges, not to speak of straining enough at this place to cause a run out.

"The placing of a riser on the highest part must at all times be observed, at the sacrifice of all other considerations." This is a new commandment added to our foundry catechism, and let us see if there is any reason for its acceptance. It is advocated because "the riser is indispensable, in order to relieve the dirt or kish which is sure to locate itself in this part." If a mold is made right there is no necessity for having dirt in any part thereof, but taking it for granted that there is dirt, which raises to the highest part of the mold, what does the riser do? It relieves the mold therefrom only to the extent of the area occupied by the riser. In the illustrations shown above the risers, A B Fig. 2, do nothing towards relieving the dirt in the mold between their respective locations. Dirt, being lighter than iron, will by the force of gravity seek the highest point and consequently travels vertically, while the writer seeks to make us believe that it will travel in a horizontal direction. The risers in Fig. 1 do not insure a clean flange, except right below their immediate location. On either side between A D, A E Fig. 3, the dirt may lodge and nothing but the making of the riser the full width of the flange will tend to prevent this. Neither does dirt always rise to the top, as many a cylinder or pulley shows in being turned up, when the kish is found to have located against the side of the mold, through some slight adhesiveness. Many cylinders are cast with a sinking head, the full size of the barrel, to insure cleanliness, which would never be done, if the placing of a riser at the highest point would absorb all of the impurities generated. We, therefore, arrive at the conclusion, that a riser, placed with the intention of being a receptacle for dirt, must, to be effective, cover an area equal to the horizontal cross sectional area of the casting.

If the riser is to fill the function of a feeding head it should be placed on the heaviest part, if possible, as this will be the last to solidify and a channel should be kept open, in order that the necessary metal to supply the shrinkage may reach the place where it is needed. The writer's contention that "it is not advisable that a feeding rod should be put more than three or four inches into the mold" is somewhat ambiguous. The feeding rod should reach the central portion of the heaviest part of the casting to be fed no matter what the distance may be. The necessity for using the feeding rod may be

done away with by supplying a feeding head having the same cross-sectional area as the part to be fed. This is exemplified in casting rolls, where a sinking head, full size, which makes it a continuation of the top of the roll, is used and afterwards turned off in the lathe.

Facing mills on the other side of the water must be in a prosperous condition if the sand used in green-sand molding contains about twenty per cent. of sea coal. Even if this is the proportion contained in the facing sand it seems to us to be rather strong. One to five makes a facing sand that we have never heard of being used. If "A Foreman Molder" is troubled with cold shuts in his castings, or, if their surface is checkered like an alligator hide, he will find the trouble disappearing by burning up his coal in some other manner.

The Manufacture and Use of Chill Rolls.

The making of chill rolls, and the method of their employment in tin plate works, constitute subjects in which there is a surprising lack of technical knowledge, or even concensus of opinion. In nearly all chill roll foundries practically the same methods prevail so far as the mechanical manipulation goes, yet by slight variations in the mixture and in the details of practice, which are perhaps not well understood by the manufacturers themselves, rolls are produced whose performance in actual practice differs widely. Not only this, but in different tin plate works, where the practice is apparently the same, rolls which are practically identical in character behave very differently. Every chill roll manufacturer can tell of cases where he furnished to two works rolls which bore every evidence of being identical in character, and which in one plant gave eminent satisfaction, while in the other their performance was made the basis of complaint, although as careful a scrutiny as could be made failed to show up any difference in the manner of their use which could account for the difference in the results obtained. It must be admitted that there are present such differences in the way tin plate rolls are used in different plants as will sometimes, or perhaps frequently, account for the breakage of a roll in one plant when it would have enjoyed a long and successful career in another.

There is not now such an understanding, on the part of either foundrymen or tin plate works managers, or the exact modus operandi by which a tin plate roll is broken, as will permit of improvements being made in their manufacture or use to greatly reduce roll breakage. It is now pretty generally admitted that the breakage of tin plate rolls is due to either faulty manufacture or something in their use in which temperature is the governing factor. Whether or not there has been a fault in the manufacture can be determined by the proper examination of the roll after it has been broken, but when no such defect of manufacture exists, the subject has been only slightly limited when the trouble has been attributed to something connected with heat. It was shown some time since, in a series of articles in these columns, that no such pressures are obtained in anything like normal practice in tin plate rolling as will break a tin plate roll, of ordinarily good manufacture, which is not subject to internal strains. While a roll may be in such a state of stress as it comes from the foundry as will make it weak enough to be broken in ordinary practice, the great number of rolls which are not broken, but wear out in service, shows that such a state of original stress is not inherently connected with their method of manufacture, and it follows that very many breakages probably the great majority—are due to internal stresses set up by irregular expansion. This irregular expansion may be due to different co-efficients of expansion in different parts of the roll, or to different temperatures in different parts of the roll, or a combination of both. It should be pointed out again, that in a tin plate roll the iron of which has the tensile strength which it should have there is strength sufficient to withstand from 15 to 20 times the pressure which is developed in ordinary tin plate rolling. If the roll breaks, it may sometimes be shown that it did so while attempting a reduction in the pack rolled considerably greater than the normal. This proves one cause of breakage, but does not prove that this is the principal cause, and it has been shown that this is not in itself anything like a sufficient cause. The greater cause lies in internal stresses, the slightly increased pressure from the pack being simply the "last straw." If no internal stresses were present, no moderately good chill roll could be broken by giving a cold pack double the reduction which a hot pack usually undergoes.—Tin and Terne.

THE FOUNDRY

Published Monthly by

"The Foundry Publishing Co."

DETROIT, MICH.

JOHN A. PENTON - - - EDITOR AND MANAGER.
HENRY HANSEN - - - - ASSOCIATE EDITOR.

SUBSCRIPTION PRICE:

$1.00 a year in advance, postage prepaid in the United States, Canada and Mexico.

$1.75 a year to other countries, postage prepaid.

Single Copies, 15 Cents.

Advertising Rates are Printed in Each Issue, on Page Containing Alphabetical Index to Advertisers.

Space in advertising pages only is for sale.

We invite correspondence on subjects pertaining to any part of the foundry business.

Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.

The Detroit News Co. will supply the trade with THE FOUNDRY, through the regular channels of the American News Co.

Entered at the Post Office at Detroit, Mich., as second-class matter.

Trade Outlook.

Despite the beginning of war the iron trade continues to show considerable activity. It is claimed by many with some show of justice that although such is the case, yet the uncertainty incident to this has had the effect of keeping back new enterprises, which have for a long time been contemplated. While a few foundries are running rather light, yet quite a number are very busy. Malleable foundries especially seem to have their hands full, and more than one report turning business away because they are too busy. Harvesting machine works are increasing their orders, and with hardly an exception are crowded to their utmost to take care of the business that is being offered them. Railroads who make their own wheels and castings seem to be running full and purchasing considerable material outside. That the industrial works of this country are pretty hard fighters is shown in the bidding on an order for about 3,200 gross tons of pipe for St. Johns, New Brunswick. It seems that there is a duty of $7 per ton on cast iron pipe, which after July 1 will be $6 per ton for British makers, while it will be $8 for American producers. To begin with, therefore, the latter are at a disadvantage of $2 per ton. In spite of this the National Foundry and Pipe Works of Scottdale, Pa., were the lowest bidders. The following are the bids: R. McLaren & Co., Glasgow, Scotland, $31; Three Rivers Iron Company, Quebec, $28.50; Montreal Pipe & Foundry Company, $29.45; Howard Harrison Iron Company, $33.96; R. D. Wood & Co., of Philadelphia, $29.50; T. McAvity & Sons, $29.25; Londonderry Iron Company, Londonderry, N. S., $29.30; J. & R. Roberts, Limited, West Boynemouth, England, for 24-inch, $32.50 and 12-inch, $33; Addyston Pipe & Steel Company, $31.58, and the National Pipe & Foundry Company, $27.80.

You Are One of Them.

As news-gatherers of all that pertains to the foundry trade in all its branches we have been favored with a success beyond our expectations. For this we give credit to the hearty co-operation which has been tendered us by our readers. It is a sort of a custom with some trade journals to inflate their air cushions with such headings as "Special Correspondence," "From our Artist in Timbuctoo," etc., when anyone conversant with the expense of special news-gathering knows that this is only a form of self-flattery. Even the great dailies of the country, with millions of readers and millions of capital are compelled to associate in order to make the expense of news-gathering come within reasonable bounds.

We consider every reader of this paper our "special" correspondent. We do not believe in "red tape" in shop affairs, neither do we have any of that article in the publishing of this paper. We do not lay down a code of morals for correspondents to follow. If you have anything you want to tell us, write it down in anyway you like. We consider the homely language of the mechanic far more forceful and convincing than the most polished oratorical effort. We invite you to take a hand in our talks about shop affairs, in fact we ask you to consider yourself as one of our "specially appointed" correspondents.

A Brass Foundry Incident.

By K. K.

The apprentice boy at Caster's brass foundry had made a discovery that surprised and puzzled him, and incidentally Caster also.

It was in this wise, he (the apprentice, I mean), had been making some brass knobs two and a half inches in diameter, they were cored out to 3-32" in thickness and were used to decorate the railing, that kept visitors from getting tangled up in the working parts of the big engines, built by the firm.

A small V-shaped gate, the size of one's finger-tip was used to run them, and the sprue was an inch in thickness and about four inches in height.

The apprentice had made hundreds of them, and never had any trouble nor did he have any trouble on this occasion, only he forgot the cores in one of the molds, and when he came to shake out, he discovered that, and was surprised, not only at having forgotten his cores, but at the appearance of the castings.

As knobs they were certainly bad, not having cores, but as castings, they were good, and this is what puzzled him.

If they had been wanted solid, Caster's way and everything had to be done his way would have been to put on a large gate, heavy sprue about 5 inches in height, and pour cool, and he would not have expected to get them in any other way; nor would the apprentice, as, of course, he only knew what Caster had told him.

But here they were, and Caster, when he had examined them well, remarked that it was "funny" what a difference hot metal could make. Poured cool, those things would have been flat on top with that gate and head.

Unimportant as the incident was, it was not without results, for a day or two after, when "Tramp" made a couple of heavy boxes and lost them by shrinkage, Caster, according to his habit, said he thought the metal had been hot enough, and was going on further, but suddenly recollected something, checked himself and said in a resigned tone, "Well, we'll have to try them a little hotter next time," which they did and got them all right, and so "Tramp" was absolved from blame, as Caster always regulated the heat of the metal.

"All of which goes to show, I suppose, that it is best to pour hot instead of cool," said Tramp when the incident cropped up at the noon hour. "Some of you, however, will remember many things that it is better to pour cool, and so we come to the fact that every molder ought to be able when his metal is at the right heat to suit his work and manner of molding it. And most of them do. Some foremen, however, are so officious that they will not allow this, and, like Caster, compel the molder to pour cool when they know the metal should be hot. A heavy bearing box, rammed firm on the back, will require hotter metal than if rammed soft. With cool metal it will be either concave or 'shrunk,' while the 'soft' one poured hot, will probably 'buckle.' I knew how I had rammed those boxes, and was, of course, more capable of regulating the metal than was Caster, but you could not tell him that. Thin pieces have to be poured hot, or else the metal will be likely to set before the mold is filled. A casting that is not what would be called thin, but is less than an inch in thickness, may be safely poured with the metal at a medium temperature, there being very little danger of shrinkage, as the metal solidifies too quickly, and by pouring cool we get nicer looking castings; but where there is over an inch of metal, in my opinion, to be on the safe side it is best to pour with the metal at a lively heat, although it need not be boiling."

Here he paused, but as no one said anything, he continued:

"I've worked in shops where they pour everything hot, and you'd be surprised at the luck they had. I don't remember ever seeing a shrunken casting, while 'drawing' at the gate would be a surprise, while here, where we generally pour cool and put on heavy sprues, it's nothing out of the way to see a shrunken casting. If I had my way—but it's no use talking. I can't—but, anyway, I always feel good when I am given a chance to use hot metal, especially on 'chunky' work, and I always make the molds so they will stand the hot metal by having my sprues and gates clean and firm, and corners rounded off, because the hotter the metal the more liable it is to 'cut,' and that is probably the reason why some people don't care to pour hot."

Something About Foundry Office Work.

By A FOUNDRY CLERK.

The way by which weighing, shipping and receiving is done in foundries depends a good deal on the size of the plant, and the class of work produced.

In order to show the different ways, I shall give a brief explanation from personal experience in the following:

In the malleable trade, the shipping, weighing and receiving is a department by itself. Whatever product is brought into the shipping room is assorted, counted and packed up in barrels or left in loose lots. The shipper is guided by his order-book, which is lined up in such a way, that on the left hand appears the customer's name and the items which form the order, on the opposite page the items are entered in the same way, with plenty of room left, for the checking of shipments.

After the castings are sorted and counted, the clerk will enter the items in the shipping book, and if in barrels give the number of the barrel, or if in loose lots mark it loose lot or lots, afterwards the castings are weighed, and the weight also entered in the shipping book, the customer's name always stands at the head of the entry in the shipping book. Every night the shipments are reported for entry into the sales-book. Whatever may be received by the shipping department is recorded, and an extra book is kept for things received by car or vessel loads, as a consequence the receiver is the proper person to whom all incoming bills are given for checking.

In a gray iron foundry of good size doing custom work, and connected with machine, pattern and blacksmith shop, the method is somewhat different. We may find in such a place a weighman for the foundry and a shipping clerk for the whole plant. Without a system the foundry clerk would be overrun a good deal by the weigher and shipper, so he is bound to find a system which prevents running forth and back. The way I laid out this work is very simple. When the weighman appear in the office at 7 a. m. I give him the sheets from last heat made out the evening before, for himself he has made out a memorandum of all castings left over from previous heats, besides this he will take with him a lot of blank scale slips. Provided in this manner he will take his place on a desk in the scratch room, and by running over the sheets he can find in a few minutes what is marked hurry, this is hunted up, and brought to the scale for cleaning, there might be other such castings on his memorandum to which he must attend. In case he should find scrap among the lot so picked out, the fact must be reported to the foundry office, in order that there is no delay in ordering cores and tagging out of patterns. There are many other things the weighman will have to do between 7 and 8 in the morning, meanwhile the teamster will appear in the scratch room, from him he will learn that there is a load for the machine shop, but he was told to drive around a block or two, and take a lot of certain hurry castings along. Those castings are ready, they are weighed and the weight entered into the sheets, when this is done the items are copied on the scale slip, this slip is given to the teamster, and he will turn it over to the shipping clerk, the shipper will use the slip for making a way ticket, and after this is done file away the ticket for the bookkeeper, he will call for it in proper time when ready to post items and make out bills.

If the shipper is acting as receiver also, all foundry orders are given to him, he must keep track of all things coming in by wagon, car or vessel loads. On the end of the month he must make a report of all things that went out and came in. There is always more or less connection between the foundry clerk, the shipper and scaleman, one must know of each other's doings, in a way that a question can be answered on short notice.

I shall not omit the small foundry plant with from six to ten molders, and show how the work is done in such a place, indeed we may see wonders when we consider the primitive way in which orders are taken, filled and delivered.

Either a member of the firm, the foreman or a smart boy is in such a place acting as a jack-of-all-trades, it takes a person fit, to act as a life memorandum, he must be able to carry things with him in his head for weeks, months and years, but there is limit in doing work in this manner, the point is generally reached when it is found that the shanty has outgrown. The work formerly done by one is afterwards done by two or three persons, the individual system has come to an end and a well-laid-out system is to take the place. A trade paper may just then come in good time, and parties looking for advice may find that they can do still better than the fellow who is telling of his experience, and why should it not be so?

Modern Crucible Making.

The intelligent workman of to-day is not satisfied simply to take the tools and appliances that are given him and use them blindly. He wants to know where they come from, how they are made; what ma-

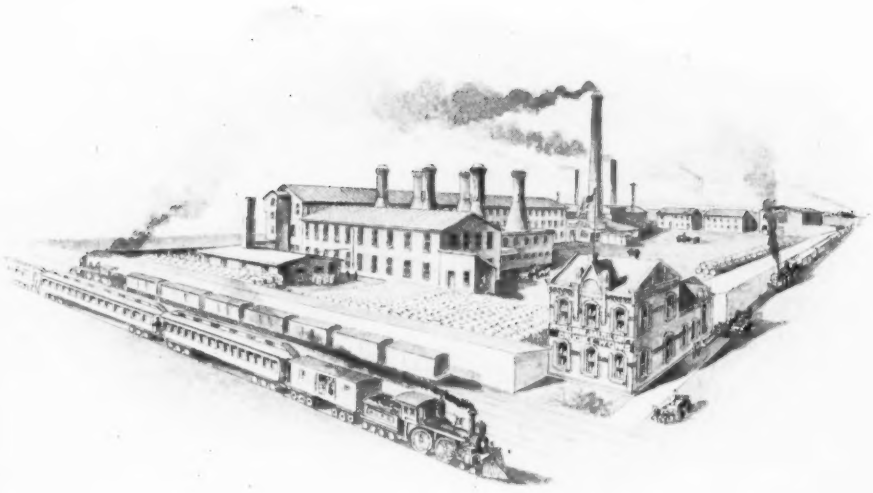


FIG. 1—BIRD'S-EYE VIEW OF WORKS OF THE MCCULLOUGH-DALZELL COMPANY, AT PITTSBURG, PA.

terials go into them; just how much and what kind of service he can expect to get out of them. And the more he knows the better workman he is.

Never before in the history of the world has there been such a widespread intelligence among workingmen, and the chief reason of it is that never before has there been such a general spirit of intelligent progressiveness among manufacturers. This

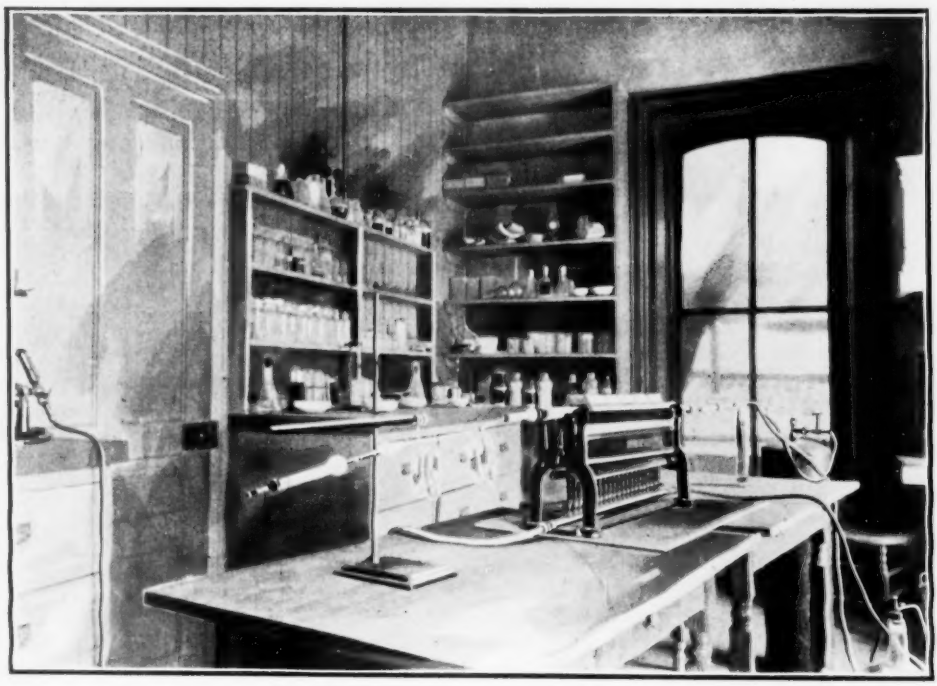


FIG. 2—LABORATORY OF MCCULLOUGH-DALZELL COMPANY.

is particularly true among foundrymen. And the fact that it is true is explanation enough of the marvelous progress that has been made in the foundry business during the past decade or so.

But to get down to the application—every foundryman, or nearly every one, uses crucibles. He is interested in crucibles; wants to know everything there is to know about them, and about the methods of their manufacture. Realizing this fact, a representative of THE FOUNDRY made a little flying trip to Pittsburgh a short time ago and visited the extensive works of the McCullough-Dalzell Company for the purpose of placing before the readers of this paper some of the more interesting points of crucible making in a thoroughly modern establishment.

FIG. 3—SHOP SCENE, MCCULLOUGH-DALZELL COMPANY.

The works of this company are among the largest of their kind in the world, and located as they are in the very heart of the world's greatest steel and brass manufacturing district, have peculiar advantages in the turning out and shipment of their product.

The works cover about three (3) acres, and are admirably located with regard to shipping facilities, having direct connection with trunk lines to all points of the compass. The plant was established in 1872, and since that time has grown steadily in size, until now, as has been stated, it is numbered among the most important crucible making establishments in the world.

They are fitted with the most perfect machinery known, and with labor saving devices of every sort. Many of these appliances are the invention of the McCullough-Dalzell Company and are used only by them. They aid very materially, not only in the production of perfect crucibles, but in the economy of labor and space. The plant is heated throughout by steam and a uniform temperature is maintained, in order that the crucibles may be unaffected by damp or cold during the process of manufacture. Everything about the establishment is as clean, and free from any foreign matter that might injure the product, as it is possible to make it, even the water that is used being carefully filtered to remove organic matter that might otherwise get into the crucible mixture.

A great deal of attention has also been paid to the comfort and convenience of the workmen, there being wash rooms, with hot and cold water, cupboards where clothing and dinner buckets can be kept, and other

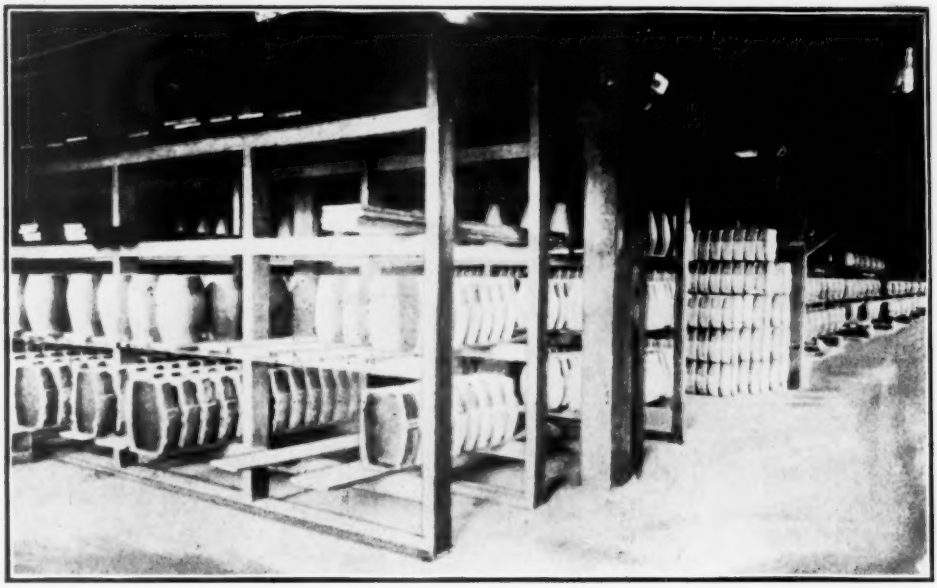


FIG. 4—PLASTER PARIS MOLDS EMPLOYED IN THE MAKING OF CRUCIBLES.

conveniences that help to make life easier and work more pleasant for the men whose skill and faithfulness count for so much to the firm employing them.

The firm maintains its own laboratory, presided over by a competent chemist whose chief delight is proving his usefulness by occasionally discovering some new combina-

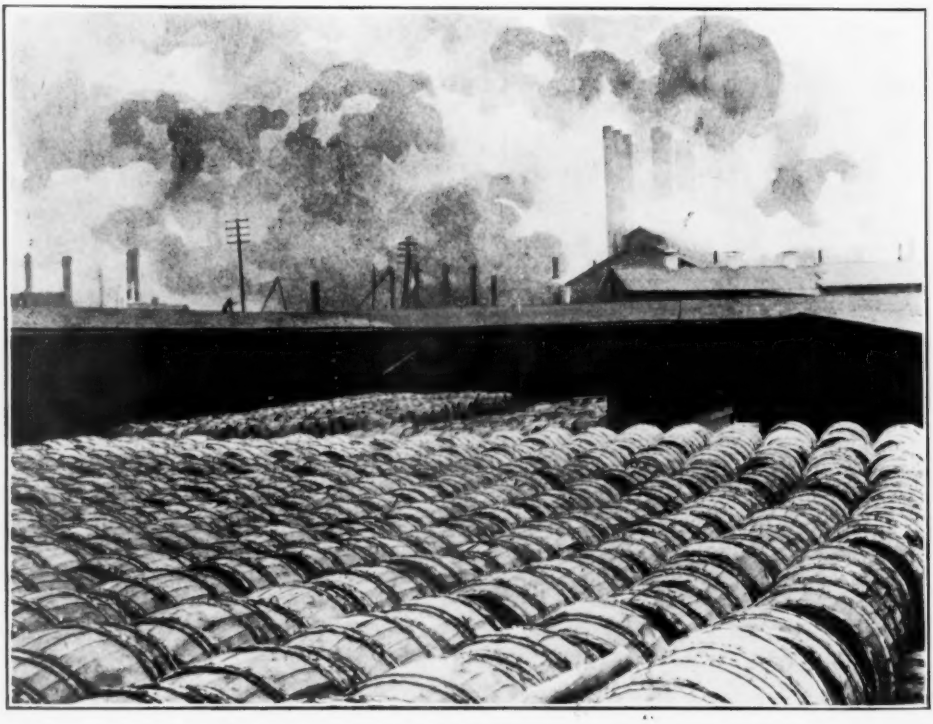


FIG. 5—YARD SCENE, IMPORTED CLAY.

tion of materials that will raise the efficiency of the crucible.

Five sizes of steel crucibles are manufactured, and thirty-five sizes of crucibles for the melting of the more precious metals, ranging from the tiny jeweler's crucible to the 900 pound melting pots used by the large brass foundries. The firm also manufactures a full line of covers, lids, stoppers, phosphorizers, teeming pots, etc.; and will make to order any special plumbago article that may be needed for either general or experimental use.

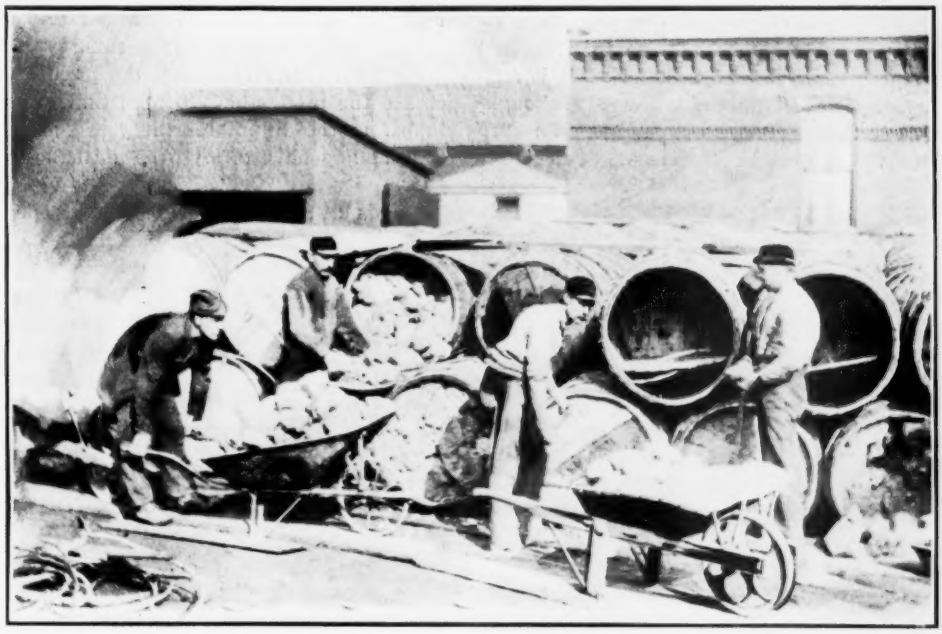


FIG. 6—UNPACKING KLINGENBERG CLAY.

The two principal materials used in crucible making are plumbago, or graphite, and clay. Neither, of itself, will make a perfect melting pot; the one crumbles, the other cracks. Together, however, combined in just the proper proportions, they produce a material that is practically impervious to heat.

Plumbago is a mineral consisting chiefly of carbon and resembling very closely the diamond, and ordinary coal. It is not so pure as the diamond, but is so similar that the diamond when subjected to intense heat is changed into plumbago. It is much purer than coal, being free from the organic substances which make coal burn, and is hence practically incombustible. It is this last property that gives it its value in crucible making.

Plumbago is frequently called graphite, or black lead, and is found in many parts of the world. It is mined similarly to coal, and comes in largest quantities from the Island of Ceylon, and from some parts of North America.

The Ceylon and American plumbago differ widely in many respects; that found in this country being of less specific gravity, and without the body of the Ceylon product. North American plumbago contains in its natural state 50 to 80 per cent of silica and other impurities that must be removed before it is of commercial value. This purifying process reduces it to the form of flake, in which it is commonly sold.

In the American mines a great deal of mica is found, and, as it resembles flake plumbago quite closely, it is very difficult to separate them. In fact, no machinery has ever been invented that will do the work satisfactorily. The presence of mica destroys the more valuable properties of graphite, and thus furnishes a very strong objection to the use of the American article.

On the other hand, Ceylon plumbago is mined practically free from foreign matter, very often running as high as 98 per cent

pure carbon; thus removing all possibility of harm in using it, by oversight or failure in the purifying process.

The plumbago used in the manufacture at this plant is imported direct from the largest and best of the Ceylon mines. It is selected with the greatest care for the particular uses to which it is to be put, and the firm believes it will give better and more uniform results than can be obtained from any other graphite in the world.

One of the greatest obstacles to be overcome in the manufacture of crucibles is the tendency to crack. A very tenacious substance is needed to hold the plumbago together, and at the same time to withstand the great heat to which the crucible is subjected. For this purpose the McCullough-Dalzell Company use a very superior fire clay, found only in Germany, at a town

FIG. 7—LUMPS OF KLINGENBERG CLAY, SHOWING OFFICIAL STAMP.

called Klingenberg. Klingenberg crown clay is probably the most carefully mined, and most valuable fire clay in the world. Each lump is stamped with the official government seal, and packed carefully in a cask for shipment. It is a remarkably pure clay, is practically unaffected by heat, and has just the proper toughness to make it almost indispensable to crucible making.

The town of Klingenberg, from which it comes, is one of the most unique places in the world; one of the few spots where the theories of Edward Bellamy and others of his class seem to have been brought into practical, everyday existence. The town owns the clay mines and each citizen derives his share from their operation. There is a surplus of five million marks out at interest, which makes taxation unnecessary, and provides plenty of capital for public improvements, such as libraries, good highways and steel bridges. It costs 500 marks to become a citizen, and even then only those who are elected by unanimous vote of the town council can get on the inside of the municipal corporation. On each holiday, and they are very frequent, every working man receives one mark for the proper celebration of the occasion.

The mining is done carefully, but in a crude manner, an old-fashioned windlass and bucket being used to take the clay from the mines. Improved machinery is not at all necessary, however, as only a limited amount is mined each year. The output and price are decided the first of the year by the town council, and nothing will induce them either to reduce the price or increase the production. Orders that are not in before the output for the year has been sold, simply have to lay over until the next year.

Towns all about Klingenberg have opened mines and endeavored to profit by its fame, but none of them has ever been able to produce a clay equal to that which comes from the original mine. Some essential property is always found to be lacking. So it is that Klingenberg continues to enjoy its little monopoly, and to dictate to the world how much clay is to be used, and how much shall be paid for it.

The burning of crucibles requires as much attention as the selection and preparation of the materials, and Pittsburg as a locality is blessed with one of the easiest regulated and most efficient fuels ever discovered, natural gas, which is employed exclusively at the McCullough-Dalzell plant and plays no small part in the production of perfect crucibles. Six kilns, each capable of holding a thousand crucibles of average size, are in constand use, the temperature being regulated to the exact point by the use of pyrometers. Before being placed in the kilns, the crucibles are slowly air dried on racks shown in one of our illustrations, after which they are kept at a gradually increasing temperature in the kiln for three days, two days being subsequently allowed for the gradual lowering of the temperature.

The McCullough-Dalzell Company has recently issued an illustrated booklet, describing some of the notable points of interest at its plant, and those of our readers who cannot make a personal visit may at least secure some idea of how one of the neces-

sities of the foundry is turned out, by sending for the book and perusing its contents at leisure.

Philadelphia Foundrymen's Association.

At the April meeting the general conditions existing in the foundry trade were regarded as promising by those who chose to express themselves on this subject.

Henry Challingsworth, superintendent of the Phoenix Iron Company's foundry at Phoenixville, Pa., exhibited a sketch of a roll on which a neck and wobbler had been burned on after breakage. In the absence of any details it was thought by those present that there was nothing particularly remarkable about this.

A paper prepared by George C. Matlack, of the Cramp Ship & Engine Building Co.'s foundry, describing the pneumatic rammer, which we illustrated in the February issue of THE FOUNDRY, closed the meeting.

The Pewabic Founders.

(By Telegraph.)

At the meeting of this association, held last Friday evening at Pewabic, Constant Humpon made a lengthy speech in which he deplored the fact that the reputation for progressive ideas which the Pewabic founders had acquired earlier in the year, was beginning to be dimmed by the yellow aspirations of other associations. Mr. Humpon thought that more committees should be appointed to investigate problems which came within ten thousand miles of postdiluvian foundry practice.

Mr. Mudtucker opposed the appointment of more committees. He said that the Pewabic Founders had nearly their entire membership tied up in committees, who never reported anything. If a question was worthy of consideration it should be placed before the association instead of being pigconholed through the medium of a committee.

Jones De Fluor Spar, B. U. M., M. E., made a motion that the Pewabic Founders should grant unanimous consent to concerted action by which five thousand foundrymen outside of Pewabic should be compelled to grade their iron according to the dictates of the members from Pewabic, Paradise Flat, Coon Hollow and other centers of the iron industry. As it now is, the speaker continued, when a man buys pig iron he does not know what he is buying. By getting up a system of specifications, something like the tariffs of the Inter-State Commerce Commission, suitably indexed, the foundryman could lay in bed till nine o'clock in the morning. If for instance Mr. Gaggerless should obtain an order for a dozen sleighshoes, all he would have to do would be to turn to his Cast Iron Dictionary and there he would find under Sleighshoes the following: Must be hard, silicon 0.97, phosphorus 0.49, manganese 0.62, sulphur 0.052, titanium trace, graphitic carbon 0.73, combined carbon 2.89. Mix thoroughly. Mr. De Fluor Spar said that this exhibition of what coudl be done by the standard indexing of cast iron ought to make it plain to every foundryman, who didn't stop to think, that all he would have to do to produce a certain casting would be to write out a recipe and let his cupola tender, assisted by a chemist, carefully compound same.

Major Mathias Pocahannis said he heartily approved of Mr. De Fluor Spar's sentiments, which reflected the vast amount of work he had done in an effort to lead the foundryman into something, where he would always find trouble enough to keep him busy.

Mr. Nockatuck wanted to know if the cupola tender in order to fill the prescription above mentioned for sleighshoes, would not have to pass through a pharmaceutic college. It appeared to him as if a man who could pull a line of figures down to the ninth decimal point would not be likely to besmear himself with claywash for $1.50 per diem.

Mr. De Fluor Spar replied that while it would be necessary for the cupola tender of the future to take a course in algebra in order to tell which end of a pig would melt first, and while the higher branches of foundry practice would require a man well versed in molecular phenomena, still matters could be much simplified by labeling the pigs at the furnace. He concluded by advocating the appointment of a committee by the Pewabic Founders with power to determine upon a standard label.

Wayback Gulliver said the foundryman was a queer cuss of an animal, just like other factions of humanity. He liked to have his vanity tickled by discussing something he did not understand, under the mistaken idea that he was advancing science. They like to set up a little tin joss for others to worship. The speaker said that the majority of foundrymen would call for a chemical analysis of a carload of iron and then let the

cupola tender use it to light his pipe. In other words, after they got a chemical analysis they didn't know what to do with it. Concerning the question of establishing a standard for the grading of pig iron the speaker thought that the foundryman nowadays was pinning too much faith to standards. It might be so after a while that some association would attempt to establish a standard for swabbing molds or a standard for cutting up sand. His experience had been that the foundryman who had learned to use the cheapest iron was making the largest profit. The foundryman who can use the cheapest iron has an advantage over the one who must have his iron made to a standard. It costs more to make an article within certain specifications than to make one allowing a wide variance. If a foundryman knows what he wants in the way of iron he can purchase the same in the open market without having it made to order, and if he does not know what he wants, it is useless to pay an extra price for something he fancies he ought to have. Instead of appointing a committee on "How to run a Blast Furnace" why not move the subject closer to home and appoint a committee on "How to Run a Foundry"?

On motion, duly seconded, the president was authorized to appoint such a committee and that official named Prudence Skinflint, Denny Beeswax and Constant Humpon as the persons who, owing to their extensive acquaintance outside of the foundry trade, would be likely to make a better sounding report than others, who knew what they were talking about.

Then and Now.

A recent newspaper dispatch reports Mr. P. D. Wanner, president of the Reading (Pa.) Foundry Company, as saying of the general conditions existing in the cast iron pipe trade:

"In 1872 the price was $90 a ton. Now it is a little over $16. The profits in the pipe trade induced many others to go in, and soon the business was overdone. When the supply of pipe exceeded the demand, prices began falling. The Southern foundries started up with cheap coal, iron, colored labor and low freights, and that was a new element against the pipe makers of the North. The pipe founders about Pittsburg, having their own coal, coke and iron, are able to turn out pipe at a small profit. In the old days, when we reckoned pig iron at $15 a ton, we counted all we received above $25 as profit. Now with pig iron at $10.50 per ton, when we deduct freight charges for delivering pipe we can hardly count on a margin of $4 per ton for making the pipe from pig iron. From this $4 margin per ton we pay for our labor, for interest on our plant, for our own time and clerical expense, for insurance, taxes and a lot of other expenses, so you see there is nothing in iron pipe making in the East. We start one of our foundries in Reading in a few days on work we get at a very small margin. We will give about 100 men some work to do, but I can't say how long it will continue."

Close Figuring.

Among recent bids for cast iron pipe and special castings for the use of the Worcester, Mass., water department, we find the following bids: The National Foundry Company, of Scottdale, Pa., got the contract at a bid of $16.60 per ton for pipe, and $34 per ton for castings. The other bids were: McNeil Foundry Company, Burlington, N. J., $17.24, $35.79; Warren Foundry Company, Philipsburg, N. J., $17.40, $35; Jackson & Woodin Manufacturing Company, Berwick, Pa., $17.78, $35.

Feeding Castings.

By PAUL R. RAMP.

In the April number of THE FOUNDRY I noticed an article on "Feeding Castings," by Mr. Moore. His remark that molders make a grave error by continuing the mold of a cylindrical casting a foot or more above the casting (proper) is wrong. I would like to ask why the bottom of such a casting does not shrink? My reason is, because the pressure is greater at the bottom. That being the case, why wouldn't more pressure at the top be as beneficial as at the bottom? It is an undisputable fact that the longer the feeding head on a mold, the greater the pressure. So I don't understand why the extended delusion (as Mr. Moore called it) on a cylindrical casting would not be a great deal better than a single feeding head. In speaking of a square shaft 12 inches by 15 feet, Mr. Moore says the molder adopted the "extended area" delusion, but I say he is mistaken. There is a vast difference between the illustration of the extended area delusion on a

cylindrical casting and the illustration of the feeders on the square shaft. Had the shaft been cast on end and the extended area delusion used for a feeder, I feel satisfied there would have been no shrinkholds in the casting proper. Such has been my experience.

An Object Lesson.

Occasionally we run across items of interest in printed matter issued with a view of advertising certain appliances, and the following, which we take from a pamphlet recently put out by Henry E. Pridmore, of Chicago, we think is entitled to be considered as an object lesson:

"The diagram Fig. 1 is the plan of a floor in a New England foundry filled with 270 arc lamp frame molds, each mold being 12 inches wide, by 28 inches long, by 8 inches high. Let us suppose that these molds were either put up on a bench or on a stationary machine at one end of the floor and the problem then is: How far did those molders walk in placing these molds on the floor? Measuring, it is found that the distance in a straight line from the bench or machine to the farthest mold is 55 feet, to the nearest mold is 5 feet, the average distance is 30 feet, or there and back to the bench or machine is 60 feet, and as 270 drags or nowels and 270 copes have been placed on this floor, these molders have walked 540 times 60 feet or 32,400 feet, or 7 miles and 720 feet, which is a great deal of hard work in itself when it is remembered that a heavy flask has been carried one-half of this distance."

"The diagram Fig. 2 is the plan of the same floor, filled with the same molds which have just been considered in the above paragraph. With this difference, however, that these 270 molds were actually put up on a set of the Pridmore 9x14 inch square stand molding machines, cores set and molds poured by two ordinary laborers, and on the third day they worked the machines. They were operated according to the Pridmore system, along through the floor with the sand and flasks. Before commencing work the sand lay in a long heap through the floor on the space now occupied by the two center rows of molds, and the flasks were piled in two long rows, drags on one and copes on the other side of the heap of sand. As the molds were put up they were placed on the floor close behind the machines, on the space which had been covered by sand and flasks used in making former molds. Let us apply the same problem we have just solved above. Putting up two rows of molds for each movement of the machines the average of the distances walked in laying down the flasks and back to the machine is 12 feet; and 540x12 feet is 6,480 feet, or just one-fifth of the distance that men working according to the usual system would walk in laying down these molds."

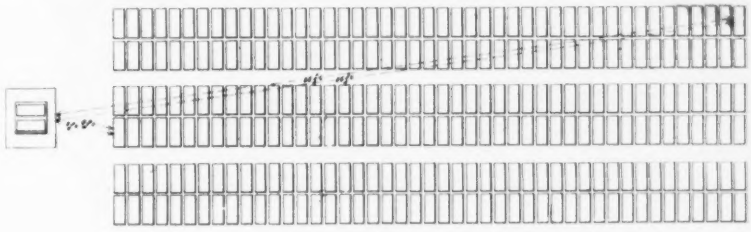


FIG. 1.

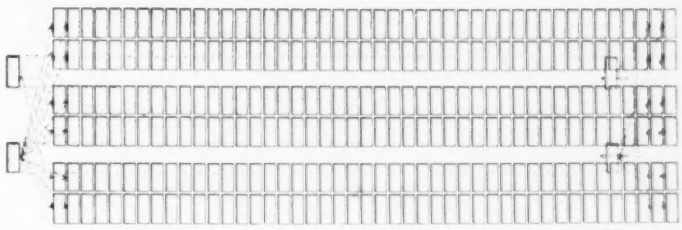


FIG. 2.

An Explanation From Mr. Bollinckx.

In the March issue we illustrated among other things a molding machine in use at the establishment of H. Bollinckx, at Brussels, Belgium, which differed from the style in use on this side in that the flask is reversed after ramming and the pattern drawn upwards, while the leading American practice is to draw the pattern downwards through stripping plates. We gave it as our opinion that more work could be turned out with the latter, though we said at the same time that we were open to conviction on this point. In a letter dated April 9, Mr. Bollinckx says:

"You are mistaken in your opinion about our molding machine, because in withdrawing the pattern the flask stands with the surface upwards, where the molder can instantly see if there is anything defective about any part of the mold. Moreover, in reversing the table with the flask the other side of the pattern is ready to receive the flask and the ramming can begin at once."

For some classes of work the arrangement of Mr. Bollinckx' machine may meet all requirements and prove far superior to hand work, something we did not question. It is to be noted that the pattern in this case is simply split in halves and mounted on both sides of a plate, the latter, together with pattern, being lifted from the mold at the same time. This form of construction may answer very well for certain castings, but the grade of work generally turned out on machines here, is of too complicated a nature to permit this practice. For such castings it becomes necessary to support certain portions of the mold while the pattern is being withdrawn as in the case of gear wheels and the like and for this purpose the "stripping plate" and "stools" are utilized. One benefit to be derived from machine molding is greater uniformity and while it may appear to be a good thing to have things so arranged that the molder can see if anything is defective with the mold we believe it is still better to have a machine so arranged that there will be no need of looking for defects. At least that would be our object in building a molding machine. If the molds should show certain defects we would change the machine so as to obviate these. While we have no doubt but that Mr. Bollinckx' machines are doing excellent work, we still think that for castings difficult to mold and requiring great exactness the machines as constructed and operated here will produce more work than the machine shown, as near as we understand it.

A Habit Which Cannot be Discarded.

Publishers THE FOUNDRY:

You will see by enclosed circular that I have retired from the foundry business for good, but I think I shall want THE FOUNDRY as long as I am able to read it. Wishing you the success your enterprise deserves, I remain, yours very truly,

R. B. WHITAKER.

Kenosha, Wis.

Effect of Exposure Upon Coke.

The Western Foundrymen's Association took up this question at its last meeting and among the opinions expressed we have selected what appears herewith:

Mr. Stantial said: I have all of my coke outdoors, but it does not stay in the pile long enough to deteriorate from exposure. I have never found that wet coke has given any poorer results than dry coke. The only thing that I have found with coke that has been exposed a long time is that it sometimes softens. I have used coke that has been kept in the shed and coke that has been exposed to the air, and never noticed any difference either in melting with same or in the quality of the castings.

Mr. Carver: I used to think that it was almost a necessity to have big coke sheds to keep the coke well housed, until by necessity we have been driven to keeping a supply out of doors. When I was in Detroit at the last session of the American Foundrymen's Association, I was surprised to see several hundred tons of coke at the Michigan Stove Company's works stored directly out in the open air. I asked Mr. Keep if he considered that it was good policy in every respect to keep it out of doors. He said yes. We keep our supply of coke out of doors and in watching it closely I see that sulphurous indications in the coke are drawn to the surface, and if there is anything in water as a solvent of sulphur it will take a large per cent of the sulphur contained in the coke. You take a piece of coke as it comes to you and it looks perfect.

After being stored awhile out of doors you will find it spotted on the exterior and discolored from the sulphur being drawn to the surface. It will look dangerous to use, but the fact is that the sulphur has been drawn to the surface and possibly practically absorbed by the atmosphere—oxidized, as our technical engineer would say. Furthermore, I think that if the coke can be treated to a good shower-bath that the melting power would be improved and you would get better iron. I notice that, particularly on a wet day when we are compelled to use wet coke we get better iron than when the coke is thoroughly dry.

Mr. Smith: I would like to ask Mr. Carver if it is not a theory that the spotted effect on the coke is caused by exposure? If a person had asked me, I would naturally have said that it would be detrimental to coke to leave it exposed, because I would have supposed that it would soften. As to the extra heat that Mr. Carver explains is due to the coke absorbing water, I think that could be explained in this way: The coke would not be consumed until it reached the proper point in the cupola and the combustion would not take place as quickly. It looks as though the moisture in the coke had assisted combustion. If it were possible to take the sulphur from the coke by exposure, there is no doubt but that the coke men would have done it.

Mr. Carver: I do not know what particular chemicals may have caused the discoloration, but I took occasion to take one sample that was badly discolored and send it to the chemist for analysis. In fact I sent it to our coke men and complained about the coke and asked them for an honest analysis. They gave me the analysis. It was 0.95 per cent sulphur. They apologized and said that no such coke should have been sent us. When we received that coke it showed no such indications of sulphur. You would not have thought that there was anything wrong with the coke at all. This piece had been exposed to the air for perhaps two months, and I selected it from the fact that it was badly spotted and discolored, and the results proved that it was very high in sulphur.

Babbitt Metal.

"Genuine" babbitt is composed of a small quantity of copper, added to tin and antimony. No lead is used, for the adjective "genuine" is applied especially to distinguish it from the cheaper grades containing lead.

There is considerable temptation to adulterate it with lead, owing to the difference in value of lead and tin; one pound of lead added to 100 of "genuine" makes a gain of about 18 cents. The character of the alloy would not be greatly altered, but when the purchaser pays for the best he certainly has a right to expect it. Fortunately, it is easy to detect such adulteration; take a piece and use it for a pencil, if it makes a mark, then it contains lead, as a small amount of lead added to tin causes the latter to mark paper. The following proportions may be used in making this alloy.

No. 1:

Copper	4 lbs.
Tin	8 "
Antimony	8 "

This forms the hardening, as it is called. First melt the copper, add the tin and afterwards the antimony; remove from the fire and let cool down to a dull red heat, then add 16 pounds more tin to increase the fusibility of the hardening. This makes 32 pounds hardening, add this to 64 pounds more tin—the proportions of tin to hardening thus being two to one. The additional tin should be melted separately in a kettle or suitable vessel, and the hardening added either in ingot form, or direct from the furnace; in the latter case be sure the tin is all melted, otherwise an accident might occur by the hot metal from the furnace falling on the damp end of a projecting ingot.

To prevent loss by oxidation, the contents of the kettle should not be heated much above the melting point. In cases where a cheaper composition is desirable, the following can be recommended:

No. 2:

Genuine hardening	32 lbs.
Tin	64 "
Lead	93 "

This forms a good alloy; another one is:

No. 3:

Hardening	16 lbs
Tin	50 "
Antimony	20 "
Lead	80 "

In mixing this alloy, first melt a portion of the lead, say 40 pounds, in the kettle, or in a crucible in the furnace, bring to a dull

red heat, add the antimony, in small pieces, when melted add the balance of lead. Do not attempt to melt the antimony without the lead bath, as it is a volatile metal and there would be loss from oxidation.

In making all alloys containing hardening, a furnace is necessary to melt the copper. The following mixtures contain no copper, and are fairly good compositions:

No. 4: For hardening take

Lead	145 lbs.
Tin	40 "
Antimony	20 "

Melt 145 lbs. lead and 40 lbs. tin and add 52 lbs. hardening.

No. 5, For hardening:

Lead	48 lbs.
Antimony	26 "

Add this amount to 152 lbs. lead The hardening is used in this merely to form a bath for the antimony, and any portion of the 200 lbs. lead may be taken. This is cheap and soft.

Another cheap composition is formed as follows, and is known as "hard lead":

No. 6:

Lead	80 lbs.
Antimony	20 "

Hard lead is a better metal than No. 5. It is largely used for lining car journal bearing. It may be improved by the addition of tin, as in the following:

Hard lead	100 lbs.
Tin	100 "

This is given as an illustration. A great variety of alloys can be made by taking hard lead as a base and adding tin in varying quantities.—C. Vickers, in American Metal Worker.

Furnace Facts About Foundry Iron.*

BY CHARLES W. FRIEND

It gives me pleasure to read before you this evening a paper in which I try to set forth a few facts about foundry iron as seen from a manufacturer's standpoint.

I know from experience that a blast furnaceman is looked upon by foundrymen as little better than a robber, whose sole object is to get rid of his product, whether good or bad, without regard to how the iron will work for the poor foundry that receives it. Now, gentlemen, this is not so. The manufacturer to-day is trying his best to give the foundryman the best iron he can for his particular purpose. With this idea in view, manufacturers have employed chemists, and the more advanced furnaces have quit the old, haphazard practice of piling all iron together which happens to grade as No. 1, No. 2, No. 3, etc., when the chances are that the No. 1 is the hardest of the lot, and only fit to make rolling mill castings, while No. 2 or No. 3 is an ideal iron for making snap-flask work.

But, in many instances, the foundryman in buying his iron misrepresents facts to his own detriment. For example, a salesman goes to sell Mr. Brown, who is running a foundry (of course not in Pittsburg or vicinity), a car of iron. He tells him how soft his iron is, how much scrap it will carry, and all its good qualities. The price is satisfactory, and Mr. Brown buys. The salesman asks him what kind of castings he makes, and how much scrap he wants to use. Now, Mr. Brown will not trust the manufacturer. He wants a soft iron to carry 20 or 30 per cent of scrap, and make good machine castings, but thinking he will get something extra soft, he tells the salesman he is going to use 60 per cent scrap and makes small castings. The order comes in to the furnace, and the iron is shipped, containing 3.70 or 3.80 per cent of graphitic carbon, which Mr. Brown tries to work with his 30 per cent good scrap, and the result is that his castings are so dirty and full of blow-holes that they are a total loss; whereas, if he had told the salesman the truth, and trusted the manufacturer, an iron of the proper analysis would have been shipped him, his castings would probably have been just what he wanted, and the furnaceman would not have lost Mr. Brown's trade.

Another thing which makers of foundry iron have to contend with is high sulphur coke, which sometimes will get into the best run foundries. This coke looks all right, is from the same parties from whom the last lot was bought, and the foundryman knows nothing about it until his castings begin to come hard, and his shrinkage is away above what it should be. He is in trouble, and the first thing he does is to blame the iron. He may have three or four different brands in his mixture, and, of course, he blames the

*Paper read before the Pittsburg Foundrymen's Association, March 28, 1898.

iron which has the closest grain and looks hard, when the chances are that this is the softest iron in his mixture. He keeps changing his iron around with no better results until, in despair, he sends samples of his iron, castings, scrap, etc., to the furnaceman. These are analyzed. The castings are found high in sulphur, while the iron and scrap are all right; therefore the trouble must be with the coke. This is analyzed, the sulphur found, new coke used, and the foundryman gets good results.

As I said before, the foundrymen's practice of judging iron by the fracture often causes a great deal of trouble. It is easy for the furnace to make a No. 1 iron with 2¾ per cent silicon and .040 per cent sulphur, but it is a different matter to make open iron with 2¾ per cent silicon and .012 sulphur. To make low sulphur iron it is necessary to use a large amount of limestone in the ore mixture, which takes the silicon as well as the sulphur out of the iron; and to get high silicon iron under these conditions it is necessary to work a blast furnace very hot. This requires more coke, and closes up the grain of the iron. But tests which we have made time and again show that the low sulphur iron is by far the softer of the two. But what furnace is going to use more coke and more limestone per ton of iron produced and then make an iron which, although better, is not salable to many foundries?

This idea of close iron always being hard probably comes from the fact that in past years the old-fashioned blast furnace very seldom made iron which was close from being made at too high a temperature, but often made close iron with low silicon and a very high sulphur, due to the furnace working too cold and irregular. This kind of iron would, of course, be hard and have great shrinkage.

Following is a series of tests which were made with the idea of determining iron of suitable analyses for various kinds of work. These tests were made by charging 1,000 pounds of pig iron in a regular 24-inch cupola operated as in the regular foundry practice. The iron was run into strips 1-8 inch and 3-32 inch thick, the 1-8 inch strips being 2 inches wide and 24 inches long, the 3-32 inch strips being 2 inches wide and 20 inches long, gated at one end, and poured while in a horizontal position. By this means the relative fluidity and softness were determined. The tensile strength and transverse strength were determined by bars of standard cross section cast in pairs from one gate. All tests were made by the same set of men, so as to get the personal factor as nearly uniform as possible. In the above tables where the word "soft" is used it is understood that all the strips were easily filed at the extreme end from the gate. "Medium" means that the 1-8 inch strips were soft and the 3-32 inch strips hard. "Hard" means

TABLE A—PURE PIG IRON.

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
Silicon	1.15	1.50	1.60	1.80	2.00	2.25	2.50	2.60	2.80	3.00
Sulphur	.010	.012	014	.116	.018	.016	.020	.024	.02	.022
Phosphor	.60	.56	.58	.61	.55	.54	.61	.60	.52	.60
Manganese	.50	.52	.40	.45	.90	.50	.70	.45	.80	.35
Graph. Car.	3.60	3.10	3.20	3.46	3.00	3.70	3.30	3.80	3.50	3.70
Com. Car.	.12	.35	.30	.25	.14	.12	.18	.16	.20	.06
Tensile Str.	16000	19000	15000	24000	18000	17000	18000	16000	15500	14500
Trans. Str.	1800	2100	1700	3000	1600	1700	2000	1500	1600	1400
Fluid	Flu.	Flu	Flu.	Flu.	Flu.	Flu.	Flu.	Flu.	Flu.	Flu.
Soft	Soft.	Med.	Soft.	Hard.	Med.	Soft.	Soft.	Soft.	Med.	Soft

TABLE B.

Same iron with 30 per cent good machinery scrap:

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
Softness	Soft.	Med.	Soft.	Hard.	Hard.	Soft.	Med.	Soft.	Med.	Soft
Fluidity	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd

TABLE C.

Same iron with 60 per cent good machinery scrap:

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
Softness	Hard.	Hard.	Med.	Hard.	Hard.	Soft.	Soft.	Soft.	Med.	Soft.
Fluidity	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd	Flu'd

that all strips were hard. Under "Fluidity," "fluid" means all strips were fluid. "Medium" means the 1-8 inch strips ran out while the 3-32 inch strips did not run out full. These particular tests were selected on account of the silicon analyses.

Note that test No. 1, Table A, with silicon 1.15 per cent, was both soft and fluid. This is due to the high graphitic carbon and low combined carbon. Other tests made with low silicon, low graphitic carbon and high combined carbon being fluid, but hard. As seen in Tables B and C, this iron was soft with 30 per cent scrap, but hard with 60 per cent scrap. Test No. 2, with 1.50 silicon, illustrates the effect of high combined carbon with low graphitic carbon. No. 4 shows high tensile and transverse strength. No. 5 shows the effect of high manganese, also that comparatively low graphitic carbon ing wherein the carbon is wholly graphitic be interesting to see how much scrap an iron like No. 10 would carry. In fracture this iron was light colored and very close grained. The test bars and strips were uniform, close gray castings with an apparent difference between that with 30 per cent scrap and 60 per cent scrap.

To sum up these tests, it might be said, to obtain a soft iron on a basis of 1.50 per cent silicon, the sulphur must be very low, the graphitic carbon high, and the combined carbon low. As the silicon increases, the sulphur may increase slightly without noticeable result. For scrap carrying purposes, the graphitic carbon should be high, with enough silicon to keep the carbon in that state. The sulphur should be as low as possible, for it should be remembered that under ordinary conditions the oftener iron is melted with coke the more sulphur it takes up. For fluidity we must look to the phosphorus, for to this element more than to any other fluidity is due, and as the silicon increases so must the phosphorus, to obtain the same fluidity.

At one time, after the furnace was coked down on a Bessemer mixture, we made, in starting, iron containing 8½ per cent silicon and 3.80 per cent graphitic carbon. We were going to put the iron through the furnace again when a foundryman happened along and saw it. He insisted it was just what he wanted, and took away a load to try. It melted all right in the cupola, but was so thick he had trouble in pouring it out of the ladle, and, of course, it would not run in his molds. If this iron had contained 1¼ per cent of 1½ per cent phosphorus, it would have been fluid enough to make the finest castings.

Gentlemen, I want to thank you for your kind attention during the reading of this paper, and ask you to remember that the latchstring at Clinton Furnace is always out, and we will be glad to show you around the plant at any time you happen to be in our direction.

Specific Gravity Tests of Cast Iron.

Whether an equal volume of what is commonly termed hard and soft iron differs in weight is one of the questions in which there has always been found considerable room for argument. To all appearances a casting having its carbon in the combined state presents a denser section than a casting wherein the carbon is wholly graphitic. Mr. Thos. D. West recently made some experiments to determine the specific gravity of the same kind of cast iron, cast under different conditions. The results of Mr. West's investigations were embodied in a paper presented before the meeting of the German Foundrymen's Association held in Berlin February 7, 1898, from which we reproduce the following:

"To obtain specific gravity tests of small roll castings, having one end chilled and the other gray when inserted vertically in a bath of metal, having a similar composition when solid, the following plan was adhered to: I cast rolls about 12″ long by 2⅜″ diameter, 6″ of which were cast in an iron mold and 6″ in sand, formed both together by reason of having the iron mold in the bottom and sand formed on top of it incased in a wooden frame. Accompanying these several combined chill and sand roll castings, I cast rolls 6″ long in an iron mold and some in an all sand mold, thus giving three distinct bodies to test the gravity of the same iron. In the first two characters of molds mentioned, I cast a rod of ¼″ iron about 4 feet long. These rods I marked off with chalk at spaces 6″ apart, so that when the rolls were immersed in the metal I could tell by the chalk marks how far each sank and their action in raising, as their bodies enlarged by reason of increased temperature. The combined half chill and sand rolls (the chilled part being the lower end) would sink about 1 foot below the surface to stay vertically at this depth about one

minute, when the ¼" rod would show that the roll was rising to gradually assume a diagonal position to the surface, which finally left the roll in a position to display the sand part of the casting, leaving the chilled body slightly covered with the liquid metal. In testing the specific gravity of the chilled rolls, they would, upon being first immersed, sink about 30" below the surface, holding this position for several minutes, when they would gradually rise to assume a position barely visible at the metal's surface. In testing the gravity of the all sand rolls, they would, upon being first immersed, sink slightly below the surface for the first half minute, when they would gradually raise to protrude above the surface about ⅜", whereas the chilled body was barely visible. These tests were made with an iron having silicon about 1.60, sulphur .04, phosphorus 0.09, and manganese .50. Had the composition of these rolls been such as to give a harder iron, or one chilling all the body of the roll when cast in an iron mold, than the above combination of metalloids would produce, then the effects of the experiments would have been such as to have made the chilled bodies sink deeper and to maintain a level 12" or more below the metal's surface at the end of their extreme raise in temperature. These experiments conclusively demonstrate that the question of specific gravity of cast iron is dependent upon its rate of cooling, as with the same iron a casting can be poured that, by rapid cooling, would give it a density to sink far below the surface to stay down, and be invisible, whereas, by slow cooling, the same iron will almost instantly assume a buoyancy to protrude its body above the surface of the molten metal, thus demonstrating that the question of specific gravity of cold iron in molten metal requires a different consideration than has heretofore been accorded the subject by other writers."

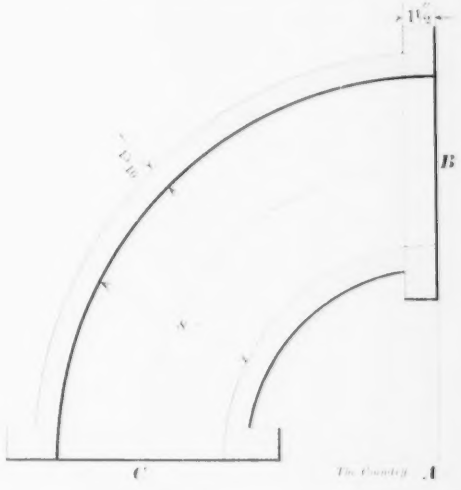
CORRESPONDENCE.

A PUZZLE.

Editor "THE FOUNDRY:"

I had a little experience last week with a quarter bend which I would not have believed had I not seen it, but could not explain its cause, or could the foundrymen who made the castings. Will give a sketch so as to explain better.

From A to B and A to C should be 26" finished. I had the pattern made 26⅛", with 1-10" shrinkage. There were four castings made before one was measured, and it was found to measure 26 7-16" to both centers. Castings were measured and all found to be the same, and then the patternmaker caught the blame. I had the pattern measured very carefully and found it to be right to the above measurements the inside and outside circumference being so great, I thought, that the shrinkage had a tendency to straighten out the curve, so



we tried a square on the flanges of the castings, and found them to be as good as could be expected on a casting. Now this may be hard to believe, but I could get vouchers for it, and I have cut ¼" from the back of each flange, making the pattern smaller than the casting is to finish to.

If you or any of the readers of THE FOUNDRY could explain this, I would like to hear from them.

E. EDWIN LEACH.

Baltimore, Md.

GRAPHITIC AND COMBINED CARBON IN PIG IRON.

Editor THE FOUNDRY:

Will you please afford space for the following item which is to correct the sense which was taken of my communication to the March meeting of Western Foundrymen's Association. The copy I sent had the carbon all in the plural number, which implies the two states in which carbon exists in pig metal, and was written to prove that it was not essential to determine how much of the carbon was held in a graphitic or combined form with the pig metal, as some had claimed it was. The effect of the total car-

bon in pig iron I did not touch. If I had wished to treat this point, I would not have taken up the subject of chill and sand casting of pig metal as I did. It is to be regretted that the question I raised in my communication regarding it being unnecessary to determine the graphitic and combined carbon in the total carbon of iron was misunderstood, as many require to be righted in their views of this question. The writer does not deny the necessity of often knowing the amount of total carbon which exists in pig iron, and wishes it understood that this is a question wholly foreign to what he presented. THOS. D. WEST.

FORMULA FOR BABBITT METAL.

Editor THE FOUNDRY:

Replying to a question appearing in a former issue of THE FOUNDRY, babbitt metal is made by melting separately 4 parts copper, 12 parts banca tin, 8 regulus of antimony and adding 12 parts of tin after fusion. The antimony is added to the first portion of the tin, and the copper is introduced after taking the melting pot from the fire and before pouring into the mold.

The charge is kept from oxidation by a surface of powdered charcoal. The "lining metal" consists of this "hardening metal" fused with twice its weight of tin, thus making 3.7 part copper, 7.4 parts antimony and 88.9 parts tin. From experience I have found that it is better to mix a bulk of this and pour it into ingots.

A very much cheaper composition that is used in place of babbitt metal is composed of 8 pounds of lead and one of antimony, or the person using it can determine haw hard it is required for the job at hand by adding antimony, though I would recommend 8 to 1 as a basis for experimenting.

JOHN A. MACAULEY.

Calumet, Mich.

New Alloys.

For many years the Japanese have been celebrated for their skill in the decorative arts, but recently they have become an important nation in other industries. In the working of metals they show a great deal of intelligence. The process by which some of their alloys of brass and copper are made have lately been revealed. The finest Japanese brass, called "sinchu" consists of ten parts of copper and five of zinc. Another very beautiful alloy, called "shadko," to which brilliant hues are imparted by treatment with acids, is formed by mixing gold and copper, the proportion of gold varying from 1 to 10 per cent. of the entire mass. These metals are extensively used in their decorative articles which are also utilized for other purposes.—Stoves and Hardware Reporter.

We think any alloy containing 10 per cent. of gold has a "brilliant hue," whether it has a Japanese name or not.

Estimating the Cost of Castings.

We have often said in these columns that the competitor most to be feared was the one who bid on work without knowing what he was bidding on, or without being informed about all the little things which affect the cost of castings. The plan generally pursued is to make a general price covering the supposed requirements of the purchaser, the bidder necessarily being somewhat in the dark as to the orders he will receive for castings from the various patterns. Frequently the foundryman finds that his orders have been for a large portion of castings from patterns difficult to handle, while the orders for the kind of castings which he calculated to help him out in the general average have been very small, and as a consequence his estimates are at variance with the results obtained.

The Acme Malleable Iron Works, of Buffalo, N. Y., recognizing the dissatisfaction resulting from what we may justly term "loose methods" of calculating the cost of producing castings lately issued a circular to their customers in which they say:

"It is our desire to supply our friends, not only the high grade of metal we produce, but castings made close to pattern and nicely molded. In order to do this and, at same time produce work economically, it is essential that we be furnished with suitable gates of brass or metal patterns with but one kind or shape on a gate.

Castings made from wood patterns and core boxes are not as true to pattern or as accurate as those made from metal or brass patterns, and, owing to the swelling of the wood, when in contact with the damp sand, the cores and prints vary, producing unsatisfactory work.

Having been asked if we grind sprues from castings, we wish to state that we do so only when requested to and then at actual cost for the work.

Castings made from single or ungated patterns, when gate is cut in mold by the molder, necessarily have much larger sprues on, than when cast from a gate of patterns.

We give you this general information that, should your attention not have been called to it before, you may more fully understand the requirements essential to the production of first-class work at minimum prices."

Accompanying this a sheet ruled and spaced for the convenience of the customer, the heading of which and its general form is as follows:

"It is difficult to make an estimate on cost of producing work without having full information before us as to kind and condition of patterns and quantity of castings required.

If you will kindly answer the inquiries enumerated below, we will then have the requisite data for making close estimates and naming prices.

Patterns Made of	Core Boxes Made of	No. of Pattern.	Weight of One Casting.	Pieces on Gate.	Pieces Ungated.	Estimated Amount Used Yearly.	No. Pieces Usually Ordered at One Time.	Amount Wanted Now.	ESTIMATE. Molding.	Cores.	Iron, &c.	Cost.	Price.

This is a step in the right direction and we feel that there would be far less slashing of prices if each foundryman actually knew what he was doing in making estimates for new work especially.

Quick Delivery of Ponderous Machinery

On January 5th, The Frank-Kneeland Machine Co. of Pittsburgh, Pa., builders of rolling mill machinery, received an order for a thirty-eight inch (38") Blooming Mill from The Carnegie Steel Co., Ltd., and shipped same March 15th, the stipulated time. When it is considered that all patterns had to be made, and the complement of castings made, the housings of which weigh seventy thousand pounds, the bed plates sixty thousand pounds, and other parts in proportion, one gets an adequate idea of the facilities of the Frank-Kneeland Machine Co.

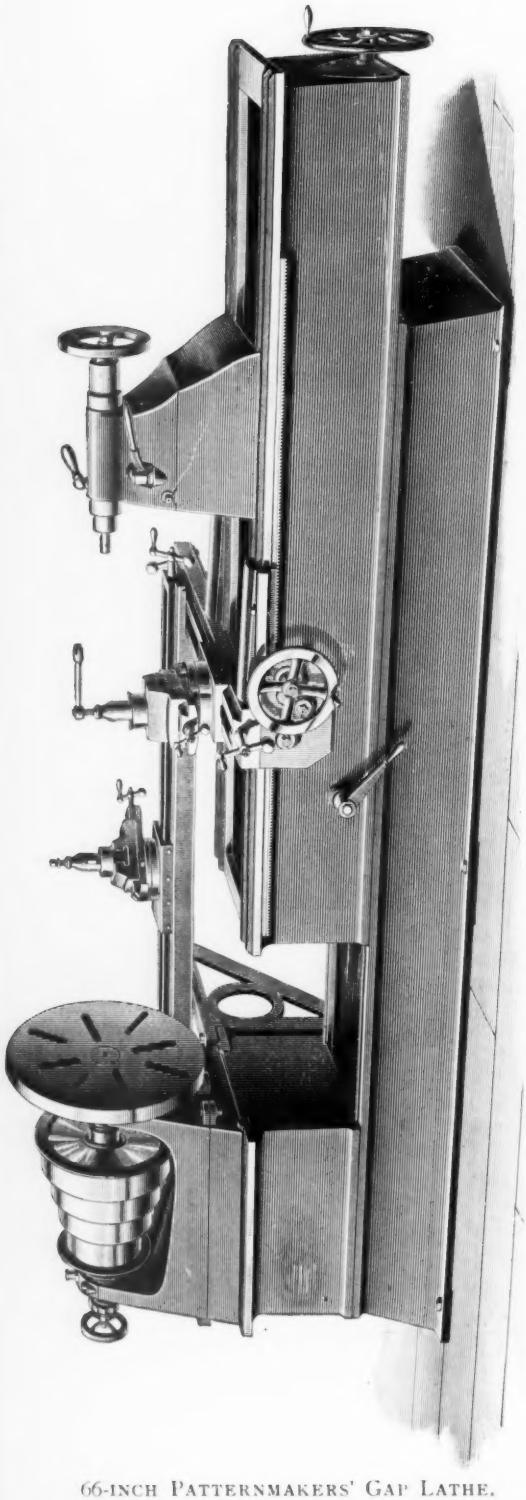
The Carnegie Steel Co., Ltd., are much pleased with the promptness of execution and high character of the work, and in recognition have given them an order for a Hydraulic Shear to weigh one hundred and fifty thousand pounds.

During progress of the above work, they turned out six Cold Mills and Gearing for the U. S. Iron & Tin Plate Mnfg. Co., Transfer and Shear Tables for universal mill for Granite City Steel Co., an 18" Skelp Mill, and an Automatic Shear and Tables for Moorehead, Brother & Co., a 24" Tin Mill for Ellwood Tin Plate Co., two 24" Mills, Doubling and Squaring Shears for Cincinnati Rolling Mill & Tin Plate Co., three sets Car Moving Devices for The Carnegie Steel Co., Ltd., Cold Mill and Gearing for Piqua Rolling Mill Co., besides other sheers, etc., and a large tonnage of sand and chilled rolls.

R. Chartrey.

During 1897 we illustrated all of the vice-presidents elected at the Detroit Convention of the American Foundrymen's Association with the exception of the vice-president for the Pacific States, Mr. R. Chartrey, vice-president of the Joshua Handy Machine Works, San Francisco, California, whose portrait adorns this issue.

Mr. Chartrey may at this time be classed among the pioneers of the Golden State hav-



66-INCH PATTERNMAKERS' GAP LATHE.

ing arrived in San Francisco from France in 1856, being at that time nine years of age. In 1860 he began to learn the machinist's trade and his aptitude for the trade is shown in the fact that he became assistant foreman of the Golden State Iron Works three years later. After serving a short time in this capacity he was promoted as foreman and later as assistant superintendent. Later he took charge of the City Iron Works, also of San Francisco, and became a member of the firm under the name of Low & Chartrey.

In 1883 the Joshua Henry Machine Works purchased the City Iron Works and Mr. Chartrey joined this company, becoming vice-president, a position he has held uninterruptedly since that time. Mr. Chartrey's 38 years' experience in foundry affairs has made him a practical man in all the details of the trade and the American Foundrymen's Association chose him as its Pacific Coast representative in its appreciation of his services.

Patternmakers' Tools.

The pattern shop, as a necessary department to every foundry, is as much interested in obtaining the best of tools for turning out work as is the foundry. The money-making machine shop of to-day is almost without exception well provided with every appliance which tends to cheapen the cost of production while the pattern shop in common with the foundry, is, as one man puts it, "slower than the Wrath of God," which is as much due to a lack of things to do with as to anything else.

We illustrate herewith a 66-inch pattern makers' gap lathe, 11½ ft. bed, the carriage of which has a compound tool block, graduated in degrees, for work up to full swing of lathe with gap closed. Compound tool block on bar at back, for work full swing of lathe when gap is open. Cone in headstock has 4 steps for 4 inch belt. Head spindle, 3 inches in diameter and front bearing 6 inches long. Counter-shaft has iron cone and two friction pulleys 18 inches dia. x 4½ inches face, one of which should run 425 revolutions, and the other, to run the lathe backwards for largest work, should run 125 revolutions per minute. Face plate slips onto a feather, and is drawn back to the collar on spindle by a rod passing through the hollow head spindle and screwed into a nut recessed, into front of face plate, by means

of the small hand wheel shown at end of headstock. On work up to 26 inches in diameter, the tool in carriage is designed to be used, and on larger work up to 66 inches in diameter, the lathe to run backwards, using the tool on bar shown at back of lathe, which is supported on a bracket attached to the bed at the front end, and, at the other end, to the carriage which is extended for that purpose, the projected end of carriage being stiffened by a bracket attached to the under side and gibbed to slide in a recess at the bottom of lower bed. The tool on carriage is used on face-plate work to the full swing of the lathe. To open gap, the top bed is moved on the lower bed by means of screw and hand wheel shown at end of bed.

These machines are manufactured by Fay & Scott, Dexter, Maine, from whom further particulars as to the efficiency of these lathes can be obtained.

FOR THE THIRD TIME

The Foundrymen of America Will Meet in One Grand Assembly to Discuss Matters of Interest.

Cincinnati is the Mecca This Time, June 7th, 8th, 9th and 10th, the Date.

As previously announced, the American Foundrymen's Association will hold its annual meeting this year in the City of Cincinnati.

The Executive Board were in receipt of two very cordial invitations, one from Cincinnati and one from Pittsburg, but selected the former largely because of its having come to hand first.

The foundry businss and its allied interests located in Ohio's Queen City have perfected an organization; committees have been appointed, and all are energetically at work making the necessary arrangements for entertaining the largest gathering of foundrymen this country has even seen.

Cincinnati's reputation for hospitality has become something of which the entire country is proud, and there is no city of its size on this continent where they attend to these matters better.

RAILROAD RATES.

Reduced rates have been secured on all railroads east of the Rocky Mountains, which will be sold to those attending the Convention, subject to the following regulations:

1. Each person desiring special rate ticket must purchase one of the regular tickets issued at the local ticket office, and must ask for and secure a printed certificate of standard form.

2. Tickets for the return journey will be sold by the ticket agent at Cincinnati, at one-third the first-class limited fare, only to those holding certificates signed by the ticket agent at point where through-ticket to place of meeting was purchased, countersigned by signature written in ink by the Secretary or clerk of the Association.

3. Tickets for return journey will be available for continuous passage only; no stop-over privileges being allowed on tickets sold at less than regular unlimited fares. Certificates will not be honored unless presented within three days after the adjournment of the meeting. It is understood that Sunday will not be reckoned as one of the three days either before the opning date, or after the closing date of the meeting. The certificates are not transferrable, and the signature affixed at the starting point, compared with the signature to the receipt, will enable the ticket agent to detect and frustrate any attempted transfer of the privilege. A transfer or misuse of certificates or tickets authorized under this rule will forfeit all privileges granted.

4. Tickets for Cincinnati can be secured three days before date of assembly of convention, except in far-distant localities where the local ticket office will extend the time sufficiently to meet the requirements. Tickets must be first-class and can be used for the return journey (providing all regulations are observed) three days after the close of the convention.

5. All certificates so secured must be handed to the Secretary of the convention within thre days of the time the Convention is called to order.

6. No reduced fare will be granted under any circumstances if purchasers of tickets fail to secure certificates at point of starting.

As the Convention days are June 7-8-9-10, and these tickets are good for three days before and after, it follows that the railroad tickets will be practically good from Friday, June 3, to Tuesday, June 14, inclusive.

HOTELS.

The Local Committee have, after carefully canvassing the situation, selected the Grand Hotel as the most convenient headquarters.

This is one of the largest and best known hotels in the Central States, conducted on both the American and European plans and has achieved quite a reputation as a first-class location for meetings of this character.

Among its chief advantages for convention headquarters might be mentioned its unusually large, airy and well lighted lobby, containing a very large number of reclining chairs and settees, its convention hall (on the main floor); and its location near one of the principal depots and very close to others. Street cars from all depots pass the door every four minutes.

For this occasion, a room on the main floor facing the office, has been set aside for the registration of the members of the Association and their friends. A few feet away is the Convention Hall, and on the next floor are rooms that are set aside for committee meetings, etc.

The rates made for those in attendance upon this gathering are: "American Plan"—$2.50 per day and upwards; "European Plan"—$1.00 per day and upwards.

The Committee are also able to quote the following rates for the hotels named below, all of which are well and favorably known.

GRAND HOTEL AND UNION DEPOT, CINCINNATI.

PASSAGEWAY IN GRAND HOTEL. ENTRANCE TO CONVENTION HALL ON THE RIGHT.

AMERICAN PLAN.

Gibson House—$2.50 to $4.50 per day.
Burnett House—$2.50 to $4.00 per day.

EUROPEAN PLAN.

St. Nicholas—$1.50 per day and upwards.
Hotel Emory—$1.00 to $2.00 per day.

PAPERS.

The following are the list of papers arranged for up to date, and which it is expected will be read by the authors and ample time given for discussion:

"A Modern Foundry," by A. W. Walker.

"The Micro-Construction of Iron and Steel," by S. S. Knight.

"The Adoption of a Standard System of Test Bars for Cast Iron," by R. G. G. Moldenke, E. M., Ph. D.

"A Talk on Brass Founding," by Chas. Vickers.

"Manganese in Cast Iron," by Guy R. Johnson.

"Trolley Systems, Their Value and Cost," by H. M. Ramp.

"Necessity of Well Mixed Furnace Casts and True Reports of Analyses," by Thos. D. West.

"The Manufacture of Steel Castings," by Stewart Johnson.

"A Test for Determining the Hardness of Cast Iron," by C. A. Bauer.

It is intended this year to have all the papers printed and ready for distribution when the convention opens.

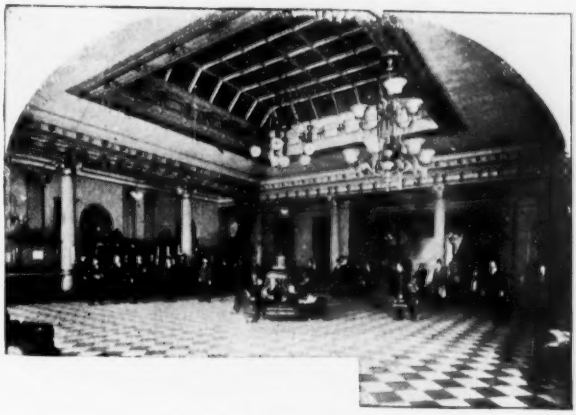
This will greatly facilitate business and permit their discussion.

ENTERTAINMENT.

The entertainment committee have arranged to make every available moment enjoyable to those who may attend this meeting, and will announce their plans in detail upon the opening of the meeting.

Thus far, however, it has been definitely decided to extend to those in attendance upon the convention a river ride from Cincinnati to Addyston.

The distance from Cincinnati to Addyston is fourteen miles by water, and the name of the steamer which will carry the visiting members there is the Island Queen. In making the trip one will pass under a bridge having the longest cantilever span in the world; also under the new C. & O. bridge, which is the heaviest bridge across the Ohio River. Likewise the party will pass under the Cincinnati suspension bridge, which, when it was built, was the longest suspension bridge in the world, and was back in the seventies counted the eighth wonder of the world. The river front is very interesting, particularly to those who are not familiar with Western waters.



LOBBY, GRAND HOTEL.

Upon arriving at Addyston the boat will tie up at the dock of the famous Addyston Pipe and Steel Co., and the guests conducted over the works by the officials, and allowed to inspect the various departments at their leisure.

There are not very many foundries in the world where the same amount of iron is melted as a daily average or with as large a capacity as this one. An inspection of it in detail will be of great interest.

Some months ago, when working on some large contracts, the daily output exceeded 350 tons a day for a considerable period.

While the work is, of course, mostly cast iron pipe for water works, gas works, etc., yet a large force of machinery molders (from 50 to 75) are kept constantly employed upon an extensive line of heavy work.

The boat will leave the city about 10 a. m., returning at 4 p. m.

The committee are also making arrangements for a smoker on an elaborate scale, to be held one evening during the meeting, and it is expected that this will be a long remembered affair.

That mysterious institution known to fame as the Plumbago Club is also arranging to initiate a few well-known foundrymen who are anxious to pierce the veil of secrecy that surrounds this much-talked-of society for the foundrymen's favor.

The committees in Cincinnati who have charge of all the arrangements are as follows:

The general committee of arrangements for this meeting have chosen as chairman Daniel McLaren, president of the Addyston Pipe & Steel Co.; treasurer, James A. Green, Matthew Addy & Co.; secretary, E. P. Wilson, secretary Board of Trade and Transportation.

The other committees are as follows:

Finance—J. W. Foley, chairman, J. W. Foley & Co.; George McG. Morris, J. B. Morris Foundry Co.; Lincoln Haney, Globe Foundry Co.; Charles Lang, Buckeye Foundry Co.; J. D. Smith, J. D. Smith Foundry Supply Co.; B. F. Haughton, Addyston Pipe & Steel Co.; George A. Gray, George A. Gray Co.; Charles Davis, Davis & Egan Machine Tool Co.; T. P. Egan, J. A. Fay & Egan Co.; Charles Hoeffinghoff, Hoeffinghoff & Lane Foundry Co.

Entertainment—D. B. Meacham, chairman; A. G. Wilson, Hoeffinghoff & Lane; Samuel H. Whittaker, Dayton Coal & Iron Co.; John Hill, Hill & Griffith Co.; Charles Greenwald, I. & E. Greenwald Co.; S. E. Hilles, Samuel C. Tatum Co.; C. H. Domhoff, Domhoff & Joyce Co.; Henry Scheu, Newport Iron & Bross Co.; H. F. Frohman, S. Obermayer Co.; Henry Gosiger, Eureka Foundry Co.; R. C. McKinney, Niles Tool Works, Hamilton; Thomas P. Gaddis, Dayton Malleable Iron Works; F. N. Black, Black & Clawson Co., Hamilton, O.; C. S. Bell, Hillsboro, O.; W. W. Hearne, Matthew Addy & Co.; B. A. Wallingford.

Reception—Lazard Kahn, chairman, F. & L. Kahn & Bros., Hamilton, O.; H. M. Lane, Lane & Bodley Co.; Thomas Griffith, Hill & Griffith Co.; Wm. T. White, J. D. Smith Foundry Supply Co.; Wm. Gilbert, Buckeye Foundry Co.; W. J. Isaacson, Dayton Coal & Iron Co.; S. T. Johnston, S. Obermayer Co.; Edwin McFarland, Matthew Addy & Co.; John Fritsch, Fritsch Foundry Co.; Charles B. Ehrhart, C. Ehrhart Foundry & Machine Co.; S. P. Jones, L. Jones Sons Co.; T. J. Joyce, Domhoff & Joyce Co.; Frank Klaine; Wm. Resor, Resor Foundry Co.; George Webb, Industrial Foundry Co.; J. A. Oberhelman, C. F. Thauwald & Co.; W. C. Herron, Rogers, Brown & Co.; L. F. Walter, Thomas A. Mack.

Obituary.

Robert Carmichael, for the past ten years superintendent of the foundry at the United States Arsenal at Watertown, Mass., died recently, aged 62.

Lewis S. Judd, a member of the Fairhaven (Mass.) Foundry Co., died April 12, aged 70. He represented his district in the Massachusetts legislature in 1868 and 1869, and was also a selectman of Fairhaven for several years.

Austin W. Warren, for many years foreman of the foundry department of the Ames Plow Co., at Worcester, Mass., died at his home, April 12, after a short illness, of pneumonia. He entered the employ of the Ames Plow Company when a boy and has remained with the company all the time, working up to the responsible position of foreman of an important department.

Edwin Fairfield Hurlbut died at Pasadena, Cal., March 24, at the age of 70. He came to Chicago from Cleveland forty years ago and became a member of the firm of N. S. Bouton & Co., which was in its day the most prominent firm in the west engaged in the general foundry business. He was afterward connected with the Union Foundry Works, but retired from active business in 1883, at about which time he bought an interest in the Dearborn foundry.

Among the Foundries.

P. Anderson is building a new foundry at Edgerton, Minn.

A foundry will be erected at Cherokee, Iowa, by Mr. Frambach.

The Craig-Reynolds Foundry at Dayton, Ohio, was burned recently.

The Moline (Ill.) Elevator Co. is doubling the capacity of its foundry.

Harding Allen, of Barre, Mass., intends to erect a foundry at that place.

H. L. Burrell has purchased the foundry of Geo. W. Nutter, at Corinna, Me.

The foundry of the Sweet & Clark Co., at Marion, Ind., was damaged by a recent fire.

More, Jones & Co., of St. Louis, Mo., will erect a 40x80 foot addition to their foundry.

The Fritch Foundry & Mach. Co., at St. Louis, Mo., was badly damaged by a recent fire.

The D. A. Tompkins Co., of Charlotte, N. C., is erecting an extensive addition to its foundry.

The Clark Machine & Foundry Co., at Franklin, Mass., are erecting an addition to its plant.

Fire recently destroyed the foundry of F. K. Routhier & Sons, at Vankleek Hill, Ont. Loss, $5,000.

The Walker Manufacturing Company will build a large steel foundry to its plant at Cleveland.

The Central City Brass & Mfg. Co., of Syracuse, N. Y., will erect a new building to cost $10,000.

George Robins and associates intend to put in operation an iron and brass foundry at Live Oak, Fla.

The Hunt-Spiller Mfg. Co., of Boston, Mass., is engaged in turning out several gun carriages for the government.

The wheel foundry, belonging to the Lima (Ohio) Locomotive and Machine Works, was badly damaged by fire recently.

The Jeanesville (Wis.) Machine Co. will build a new foundry in order to take care of their constantly increasing trade.

The Monitor Iron Works of Newark, N. J., will erect several buildings at that place, including a foundry 210x114 feet.

Thomas Price has purchased the interest of A. S. Cooper in the Shetter Foundry & Mach. Co., at New Cumberland, Ohio.

A malleable iron factory is one of the contemplated additions to the plant of the Missouri Car & Foundry Company, at Madison, Ill.

The foundry of Rhodes, Curry & Co., at Amherst, Nova Scotia, was gutted by fire a few weeks ago, resulting in a loss of $300,000.

The Scates Furnace Co., at Knoxville, Tenn., has been reorganized by F. E. Fuller, and will largely increase its output in the near future.

The Elwood, Ind., radiator factory has been sold to C. M. Converse, a Chicago manufacturer, who will reincorporate, and at once enlarge it.

Jones & Galvin, of Oswego, N. Y., have leased the Holbrook Foundry at that place and will engage in the manufacture of brass and iron castings.

George Lemoine and J. W. Wright propose to organize a stock company for the purpose of erecting a machine shop and foundry at Monroe, La.

The Kentucky Machine Company, of Louisville, Ky., has leased the Monon shops at New Albany, Ind., and will operate a foundry and machine shop.

The plant of the O. K. Stove & Range Co., at Louisville, Ky., was almost completely destroyed by fire April 4. The loss is estimated at $50,000, partly covered by insurance.

The Excelsior Stove Mfg. Co., of Quincy, Ill., will operate the plant now being erected on the site of the old Bonnet-Nance Stove Foundry, destroyed by fire some months ago.

During the month of March the Westinghouse Air Brake Company manufactured, sold, and shipped from its works at Wilmerding, Pa., 16,628 sets of air brakes for freight cars.

The Spicer Stove Co., of Providence, R. I., has purchased the entire business of the Pilgrim Stove Foundry Co., located at Plymouth, Mass., and will remove same to Providence.

Thomas C. Edwards, Joseph L. Harbinson, Harry L. Day, Geo. M. Thomson and James Finley are the incorporators of the Edwards Sad Iron Co., of Camden, N. J., capitalized at $100,000.

The National Foundry and Pipe Works, of Scottdale, Pa., has secured a contract from Worcester, Mass., for 3,000 tons of pipe at $16.60 per ton and about 85 tons of castings at $34 per ton.

The new additions to the plant of the United States Radiator Company, at West Newton, Pa., will consist of a foundry and a building 60x120 feet, for cleaning and testing purposes.

G. H. Burley & Co., of Tyrone, Pa., have purchased a site at that place, where they

propose to erect a modern plant for the manufacture of the steam and hot water heaters which bear their name.

The Eagle Foundry Co. has been incorporated at Greensboro, N. C., with a capital stock of $5,000, with the privilege of increasing to $25,000, by W. J. Teague, Neil Ellington, Tyre Glenn, John A. Hodgin and J. S. Hunter.

A charter has been issued to the Walters Stove Co., of Sharpsburg, Pa., capital $25,000. Directors: Charles A. Walters, Pliny S. Pierpont, Charles W. Walters, Stephen A. Bright, of Sharpsburg, and John Hagmaier, of Allegheny.

The William Ferguson Foundry Co. have leased the property formerly known as the Chicago Iron Works, located on the corner of Hawthorne and Willow streets, Chicago, and expect to be in a position to furnish castings by May 1st. They will make a specialty of high grade and heavy castings.

The foundry and machine shops of Phillips & McLaren, at Pittsburg, Pa., formerly owned by the Fisher Engine Foundry and Machine Company, were completely destroyed by fire April 6. The loss is $40,000. The owners carried insurance amounting to $30,000 on the building, machinery and patterns.

The Ferro-Carbon Castings Company, of Frankford, Philadelphia, Pa., of which Alfred C. Rex is Vice-President, is preparing to manufacture, on an enlarged scale, the "Atlas" metal, which is claimed to be superior to malleable cast iron for many purposes.

Jenkins & Lingle, foundrymen of Bellefonte, Pa., suffered a loss by fire on April 21, estimated at $50,000, by the burning of a large warehouse in which were stored their patterns, and on which there was no insurance. The fire communicated to several other buildings.

The Pittsburg Brass Company, which owns a plant in Allegheny City for the manufacture of fine lamps, brass and iron castings, etc., which went into the hands of a receiver in 1894, is to be succeeded by the Pittsburg Lamp & Brass Company, which has been organized with $300,000 capital stock.

The plant of the Anniston Pipe and Foundry Company, at Anniston, Ala., has been sold to the Southern Pipe Company, a new corporation. The plant is one of the best equipped in the country. A portion of it was burned last summer, and is now being rebuilt. The new owners will enlarge the plant still further.

The Francis & Nygren Foundry Co. has commenced operations at 545, 547 and 549 W. 15th st., Chicago, making a specialty of semi-steel machinery and anti-acid castings. The officers of the company are William Francis, president and treasurer; Wm. Nygren, vice-president and superintendent, and Geo. E. Allison, secretary.

The Beaver Dam Malleable Iron Co., of Beaver Dam, Wis., are enlarging their plant by the erection of another foundry building, 200x70 feet, with a capacity for 46 molders. The building is nearly completed and they expect to begin using it soon after May 1. Business in their line is crowding them to their utmost capacity.

The Ideal Mfg. Co. and the Electric Gas Stove Co., of Detroit, have consolidated their interest under the name of the Ideal Manufacturing Co., the capital stock of the new company being $250,000. The officers are: President, Jas. N. Wright; Vice-President, Hiram T. Bush; Secretary, Frank T. Dwyer; Treasurer, John H. Bissell.

The American Machinery Company, of Oakland, Cal., has been incorporated to manufacture and deal in machinery and tools of all kinds. The principal place of business is San Francisco, and the directors are Daniel Tweedle, of Alameda, and Frank Henneberg, Hubert Keon and P. P. Flood, of San Francisco. The capital stock is $20,000.

A new plant for the manufacture of castings will soon be started in Greensburg, Pa., a company having recently been organized. It is composed of the following persons: Lloyd B. Huff, Richard Coulter, Jr., Esq., J. Howard Patton, Harry C. Burkett, Thos. L. Jones, J. R. Eisaman and W. W. Truxelle. The capital stock is placed at $15,000.

Thomas Carlin's Sons, Allegheny, Pa., have received additional orders for concrete mixers, three of them going to Japan. They have also orders for a number of grinding and mixing machines for steel works and foundry facing mills, some of which are for the new type of grinding machine which they have recently put on the market.

The proposed addition to the plant of Fairbanks, Morse & Co., of Beloit, Wis., includes some fine buildings, the largest of which will

be 70x350 feet in size. To one of the gas engine shops will be added a building 85x144. To the present pattern shop will be added a fireproof addition, 102x106, the building to be 102x1156 when completed. The improvements will give employment to 200 more workmen.

The Hinckley & Egery Iron Co. and the Bangor Foundry and Machine Co., of Bangor, Me., have consolidated under the name of the Union Iron Works, with a capital of $150,000. The officers are as follows: President, Charles V. Lord; clerk and treasurer, Clarence S. Lunt; directors, Charles V. Lord, Charles A. Gibson, William S. Whitman, Hiram P. Oliver, Eugene M. Hersey, Linwood C. Tyler, Clarence S. Lunt.

The Filer & Stowell Company, Milwaukee, Wis., builders of Corliss engines and pumping machinery, have made important additions to their plant. An extension, 100x130 feet, has been built to the foundry, while the machine shop has also been enlarged 80x100 feet, and equipped with new machines. The capacity of the plant has thus been considerably increased. The company report business very brisk in their line.

W. A. Cochran is organizing a company at New Kensington, Pa., for the manufacture of chilled and sand rolls. The contemplated works will be 90 feet wide by 200 feet long with two 25-ton electric traveling cranes and two air furnaces. Mr. Cochran was the founder of the Leechburg Foundry and Machine Company and was its president and superintendent for eight years. After disposing of his interest in this company he went to Avonmore and organized the Avonmore Foundry and Machine Company.

The extensive foundry and machine shops of the Avonmore Foundry & Machine Company, located at Avonmore, Pa., have been purchased by the West Penn Foundry & Machine Company. Possession of the plant is taken at once. It is equipped with all the latest and most improved machinery for the building and turning out of open hearth steel plants, tin, sheet and bar mills, sand and chill rolls and engines of all sizes. The plant has a daily capacity of 125 tons, and employs, when running full, over 200 men. The company purchasing is composed of William Bleeker, of Leechburg, who is the president; H. H. Baxter and Henry Hitzfeldt, superintendent of the Homestead steel works. It is capitalized at $100,000 and will start active operations at once.

Another firm which is engaged in turning out war material is J. J. Ryan & Co., the noted brass founders of 68 West Monroe st., Chicago. The special job is castings for a new aerial torpedo invented by the Gathmann Brothers, of Chicago. The first order of eight torpedoes for the 12-inch guns will be ready in about 10 days. If they are successful, it is understood Ryan & Co. will devote their time to the manufacture of the shells for the government. The shells made by Ryan & Co. are of brass. The reason for using brass in making the new shells is that they can be made a great deal quicker than if composed of steel. Besides all the steel works in the country are already busily engaged upon other government work, making guns and ordnance. The brass shells which Ryan & Co. are now turning out have a tensile strength of 70,000 to 80,000 lbs.

The Effect of War on Business.

The pessimist, croaker and green-goggled visionary are again abroad in the land and predicting all sorts of disaster as a result of the little fracas between this country and Spain.

That any injury could seriously overtake America as a result of this difference of opinion between it and a seventh rate power like the one that has been guilty of these Cuban butcheries and tyrannies for so long, is not to be dreamed of.

A hundred years ago Spain owned the bulk of what is now the United States and the whole of South America, and her miserable inhuman policy and bad financeering, the cupidity and avarice of her officials, and her blundering insane methods of oppression have lost these all to her, and she now is practically making her last stand.

It will not take more than one or two good naval or land engagements to practically end the whole matter, and as a result, this country's prosperity, credit and business will receive such an impetus at home and abroad as will make its influence felt for the next decade.

Already much money is being expended and contracts let that are having a most favorable influence in many sections, while inquiries among the leading dealers in pig iron reveal the fact that as yet there is no apparent falling off in orders, prices or prospects.

"THE FOUNDRY" feels confident of the future and believes that the summer and fall of 1898 will be the best for years.

A Thousand Pounds a Minute.

There is something very fascinating and at the same time rather staggering to the average foundryman in the thought that there is in this country a foundry that day in and day out, week in and week out, for quite an extended period of time, has melted and poured half a ton of iron per minute during a working day of eight hours.

This would mean practically two hundred and forty tons a day, but when we are told that for several weeks this same establishment melted and poured over three hundred and fifty tons a day while unusually busy, it makes the first statement look small.

Yet this is and has been the record of the Addyston Pipe & Steel Co., of Addyston, Ohio, for a considerable period of time and while, of course, mainly poured into water and gas pipe and the "specials," large and small, that go with them, it does not detract from the amount of iron that must be charged with the cupolas or the size of the pig iron account.

At this establishment, however, a very large force of men are kept constantly at work bringing out some of the largest and finest machinery castings to be seen anywhere, and in no inconsiderable quantities.

This shop is to throw its doors open for the reception of those who go to Cincinnati, next June, and it will be a treat worth crossing the continent to see.

CAST IRON NOTES.

Devoted to Inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.

HARD CASTINGS.

Would you mind expressing your views on the following analysis:

Graphitic carbon 2.82, combined carbon 0.71, silicon 2.70, sulphur 0.06, phosphorus 0.61, manganese 0.12. I find this mixture rather hard to tool in the machine shop. Perhaps the combined carbon is too high. If so, what would you do to remedy same, or perhaps some of the other ingredients might be higher or lower."

A casting of this composition ought to give no trouble in the machine shop. I take for granted that the castings are pulleys and ordinary machine castings.

The pig iron scrap and fuel were exceptionally good to have produced a casting of this composition.

If a certain chemical composition could be relied upon to produce a corresponding physical structure, there would be no fault with this mixture. The hardness must have resulted from a hardness in the original scrap used with the pig, or with the pig iron itself.

To soften and to reduce the combined carbon add to the mixture a little of some good softener, a pig iron containing, say 4 to 6 per cent of silicon to 1.50 per cent of phosphorus.

Probably by throwing out some of the hard pieces of scrap iron the present mixture would be perfectly satisfactory.

MIXTURE FOR CHILLED CAR WHEELS.

"Will you be so kind as to give me a good mixture of iron for chilled car wheels?"

It would do you no good to give you names of pig irons that would make good car wheels, because the broker from whom you purchase pig iron sells you good car-wheel iron.

From the location of the postmark the writer is not likely to engage in the manufacture of chilled car wheels. If already in the business he would not have asked the question.

If it is desired to make a few small car wheels, use old car wheels for one half of the mixture and soften by adding No. 3 foundry iron.

MOLDING SAND.

A sample of sand is sent in a small box. The lump is so hard that it cannot be broken with the fingers and the color is quite red. The question was, "How does this compare with the leading machinery sands throughout the United States, and will it be good for all kinds of jobbing work?

The sand is not at all suitable for use as a molding sand. The red color comes from a large quantity of iron, which is not a desirable addition to molding sand. It contains too much clay for a good sand and is too fine for machinery. Perhaps good sand cannot be found in that locality, and it may cost too much to take good sand there. If so, find a yellow, sharp sand and mix the two until the resulting mixture has the required strength and openness.

SEMI-STEEL CASTINGS.

What are they, and how are they made?

They are ordinary cast iron castings, to which is added in the cupola steel chips from boiler plate. To make the castings solid a small quantity of pure aluminum is added

to the ladle. Small pieces of ferro silicon placed in the ladle will often accomplish the same thing. The adding of steel scrap to cast iron is not a new thing, but has been used in England and in this country for many years. The addition of aluminum or silicon to the ladle to insure soundness and to increase fluidity is comparatively modern and is necessary to success.

The strength is due, not to a chemical change, but to the mechanical mixture of the steel throughout the casting. This is shown by the fact that a second remelting which makes the mixture more perfect shows much less strength.

In a late discussion of this subject, Mr. Geo. Mattison said that two of the prominent Detroit founders purchased the right to use the McDowell process for making semi-steel. He says that this mixture consists of ordinary cast iron and scrap steel plate, melted together in the cupola, and in the bottom of the ladle is added a very small quantity of aluminum alloy, consisting of 80 parts of iron and 20 parts of aluminum. He says the usual transverse strength is 3,000 pounds measured on bars one inch square and twelve inches between supports. The strength can easily be increased to 3,500 pounds by adding more steel scrap. The 3,000-pound metal is but little harder to work than ordinary good cast iron which possesses a transverse strength of 2,000 to 2,500 pounds.

The 3,500-pound metal is somewhat harder on the tools than cast iron, but not hard enough to cause difficulties of any kind. The price is but little greater than of cast iron, as steel scrap can be bought cheaper. In fact, considering the increased strength, semi-steel certainly does not cost any more than cast iron. These firms use it whenever a reliable and strong casting is wanted. The fracture of semi-steel is very close grained and uniform, and presents an excellent wearing surface when finished.

Personal.

Joseph F. Leahy has assumed charge of the foundry connected with the Atwood-Morrison Co., at Willimantic, Conn.

Nicholas Morse, for several years foreman of the Vulcan foundry at New Castle, Pa., has started in business for himself under the firm name of the New Castle Brass Foundry Co.

Chas. A. Boyd, superintendent of the Walker Co., of Cleveland, has resigned his position to enter upon general engineering work for himself, with offices in the American Trust Building, Cleveland. Mr. Boyd has been with the Walker Company for the past four years, starting as engineer in the railway motor department, and having charge of design and construction. A year later he was placed in charge of the entire engineering department, and was promoted to the position of assistant superintendent on Jan. 1, 1897. The following March he was appointed superintendent of the Cleveland works, having in charge both the engineering department and shops.

By Way of Advertising.

Abendroth Bros. have issued from their New York office, 109-111 Beekman street, Catalogue No. 20, dealing with the hot water heaters and sectional steam boilers made by them.

Henry E. Pridmore, the well-known maker of the Pridmore molding machines, has issued a neat pamphlet describing same. It contains a short description of the conditions which lead up to the designing of these machines and much other information which those interested in the economical production of first class castings would do well to study.

The Pittsburg address of Manning, Maxwell & Moore, the Ashcroft Manufacturing Company, the Consolidated Safety Valve Company, the Hayden & Derby Manufacturing Company, the Pond Machine Tool Company, the Shaw Electric Crane Company and Pedrick & Ayer Company, have been changed from Telephone Building to the Park Building, Fifth avenue and Smithfield street, Pittsburg, Penn.

The S. Obermayer Co., of Cincinnati and Chicago, report business most excellent, operating both of their plants overtime for the past two months.

They have lately established a new department for the purpose of handling complete foundry equipments and are now in a position to accept orders for such. They also report a considerable increase in inquiries from foreign countries, some orders having recently been filled by them for Russia, Cape of Good Hope and several of the South American Republics.

How Would You Do It?

Will some readers of THE FOUNDRY kindly describe what they consider the best and cheapest method of molding a tank 12 feet long, 2 feet wide and 7 feet deep; thickness of metal ½ inch. B. A. & CO.

NOTICE!

Advertisements in this column, 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.

Answers addressed to our care will be forwarded.

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

WANTED—Experienced hollow ware molder as assistant foreman; also patternmaker in steel. Address "HOLLOW WARE," Box 123, care THE FOUNDRY.

FOR SALE—Good foundry in live manufacturing city. Good shipping point. Splendid chance for a practical man with small capital. Big bargain. Address W. Woodruff, Kankakee, Ill.

WANTED—Salesman. Only those who have had experience in the foundry facing and foundry supply line need apply. State age, salary expected and reference. Address "Zero," Box 129, care THE FOUNDRY.

METAL PATTERNMAKER desires to take charge of a pattern shop, malleable iron preferred. Thoroughly experienced. References upon application. Address "Metal Patternmaker," Box 126, care THE FOUNDRY.

FOUNDRY FOREMAN with push and ability, wishes position, first-class references. Good results mixing, melting, management of men, heavy or light machinery, in loam, dry, green sand. Temperate, reliable. Address "A," Box 130, care THE FOUNDRY.

WANTED—A position as foundry foreman of a small shop, by a young man of good and industrious habits. A first-class mechanic and can furnish the best of references. Will act as assistant in a large shop. Address Box 135, Care THE FOUNDRY.

WANTED—A good all-around wood patternmaker. Must be a hustler and thoroughly familiar with all kinds of railroad work. Must be under 40 years of age, strong, industrious and thoroughly understand his business. Address "Pattern Maker," Box 128, care THE FOUNDRY.

FOUNDRY FOREMAN desires to make a change; experience covers locomotive and stationary engines, architectural, pumping, mining and milling machinery, etc.; understands chemistry and mixing of irons to obtain best results. For particulars, address "Machinery," Box 131, care THE FOUNDRY.

A FOUNDRY CLERK, well versed in all the details of turning out work and for years connected with one of the largest foundries in America, desires to make a change. Will prove a valuable assistant to the foreman of any extensive foundry. Address "Foundry Clerk," Box 133, care THE FOUNDRY.

A RARE OPPORTUNITY—An experienced stove foundry man with some capital can obtain control of a well established stove foundry at one of the best distributing points in the West. This is a fine opening for a man with enterprise and some money. Address Stove Foundry, Box 129, Care THE FOUNDRY.

WANTED—Foundry superintendent for shop making high-grade machine tool castings; must be a progressive, broad-gauge man; salary commensurate with ability and results; first-class foundry and equipment; must know how to make good castings. Address if this fits you and "not otherwise," "Superintendent," Box 134, Care THE FOUNDRY.

WANTED—Position as foundry foreman, or would lease a foundry, or run the foundry by the ton. At present employed by large manufacturing concern; have held position as foundry foreman in large shops for over 20 years' continuous service; competent to handle any class of work except stove plate. Highest references as to ability, sobriety and economy of management. Address W. H., Box 132, Care THE FOUNDRY.

G. T. GLASCOCK & SON, GREENSBORO, N. C., have U. S. Patent on a Safety Andiron for wood. Very durable and ornamental. Will be glad to sell shop rights to foundrymen for making these Andirons. Can furnish patterns and electrotypes. Write for particulars.

The Buffalo Forge Co., of Buffalo, N. Y., report that for some time past engine orders have compelled them to operate that portion of their plant on extra time. This company has also secured several foreign orders for down draft forge outfits.